RF Communications

Table 1. Wideband (FM/FSK) IFs

Device	V_{CC}	I_{CC}	Sensitivity (Typ)	IF	Mute	RSSI	Max Data Rate	Notes	Suffix/ Package
MC13055	3–12 V	25 mA	20 µV	40 MHz	✓	✓	2.0 Mb	Wideband Data IF, includes data shaper	P/648, D/751B
MC13155	3–6 V	7.0 mA	100 µV	250 MHz	–		10 Mb	Video Speed FM IF	D/751B

Table 2. Wideband Single Conversion Receivers – VHF

Device	V_{CC}	I_{CC}	Sensitivity (Typ)	RF Input	IF	Mute	RSSI	Max Data Rate	Notes	Suffix/ Package
MC3356	3–9 V	25 mA	30 µV	200 MHz	10.7 MHz	✓	✓	500 kb	Includes front end mixer/L.O.	P/738, DW/751D
MC13156	2–6 V	5.0 mA	2.0 µV	500 MHz	21.4 MHz	–			CT–2 FM/Demodulator	DW/751E, FB/873
MC13158	2–6 V	6.0 mA						>1.2 Mb	FM IF/Demodulator with split IF for DECT	FTB/873

Table 3. Narrowband Single Conversion Receivers – VHF

Device	V_{CC}	I_{CC}	12 dB SINAD Sensitivity (Typ)	RF Input	IF	Mute	RSSI	Max Data Rate	Notes	Suffix/ Package
MC3357	4–8 V	5.0 mA	5.0 µV	45 MHz	455 kHz	✓	–	>4.8 kb	Ceramic Quad Detector/Resonator	P/648, D/751B
MC3359	4–9 V	7.0 mA	2.0 µV						Scan output option	P/707, DW/751D
MC3361C	2–8 V	6.0 mA		60 MHz				>2.4 kb	Lowest cost receiver	P648, D/751B
MC3371							✓	>4.8 kb	RSSI	P/648, D/751B
MC3372, A									RSSI, Ceramic Quad Detector/Resonator	
MC13150	3–6 V	1.8 mA	1.0 µV	500 MHz			✓ 110 dB	>9.6 kb	Coilless Detector with Adjustable Bandwidth	FTB/873, FTA/977

RF Communications (continued)

Table 4. Narrowband Dual Conversion Receivers – FM/FSK – VHF

Device	V_{CC}	I_{CC}	12 dB SINAD Sensitivity (Typ)	RF Input	IF1	IF2 (Limiter In)	Mute	RSSI	Data Rate	Notes	Suffix/ Package
MC3362	2–7 V	3.0 mA	0.7 µV	180 MHz	10.7 MHz	455 kHz	–	✓	> 4.8 kb	Includes buffered VCO output	P/724, DW/751E
MC3363		4.0 mA	0.4 µV				✓			Includes RF amp/mute	DW/751F
MC3335			0.7 µV							Low cost version	DW/751D, P/738
MC13135			1.0 µV				–			Voltage buffered RSSI, LC Quad Detector	DW/751E, P/724
MC13136										Voltage Buffered RSSI, Ceramic Quad Detector	

Table 5. Universal Cordless Phone Subsystem ICs

Device	V_{CC}	I_{CC}	Dual Conversion Receiver	Universal Dual PLL	Compander and Audio Interface	Voice Scrambler	Low Battery Detect	Programmable R_X, T_X Trim Gain and LBD Voltage Reference	Suffix/ Package
MC13109	2.0–5.5 V	Active Mode 6.7 mA Inactive Mode 40 µA	✓	✓	✓	–	1	–	FB/848B, FTA/932
MC13110	2.7–5.5 V	Active Mode 8.2 mA Inactive Mode 60 µA	✓	✓	✓	✓	2	✓	FB/848B
MC13111	2.7–5.5 V	Active Mode 8.2 mA Inactive Mode 60 µA	✓	✓	✓	–	2	✓	FB/848B

Table 6. Transmitters – AM/FM/FSK

Device	V_{CC}	I_{CC}	P_{out}	Max RF Freq Out	Max Mod Freq	Notes	Suffix/ Package
MC2833	3–8 V	10 mA	–30 dBm to +10 dBm	150 MHz	50 kHz	FM transmitter. Includes two frequency multiplier/amplifier transistors	P/648, D/751B
MC13175	2–5 V	40 mA	8.0 dBm	500 MHz	5.0 MHz	AM/FM transmitter. Single frequency PLL $f_{out} = 8 \times f_{ref}$, includes power down function	D/751B
MC13176				1.0 GHz		$f_{out} = 32 \times f_{ref}$, includes power down function	

Table 7. Balanced Modulator/Demodulator

Device	V_{CC}	I_{CC}	Function	Suffix/ Package
MC1496	3–5 V	10 mA	General purpose balanced modulator/demodulator for AM, SSB, FM detection with Carrier Balance >50 dB	P/646, D/751A

Table 8. Infrared Transceiver

Device	V_{CC}	I_{CC}	12 dB SINAD Sensitivity (Typ)	Max IF Freq	Carr Det	RSSI	Data Rate	Notes	Suffix/ Package
MC13173	3–5 V	6.5 mA	5.0 µV	10.7 MHz	✓	✓	200 kb	Includes Single Frequency PLL for T_X Carrier and R_X L_O	FTB/873

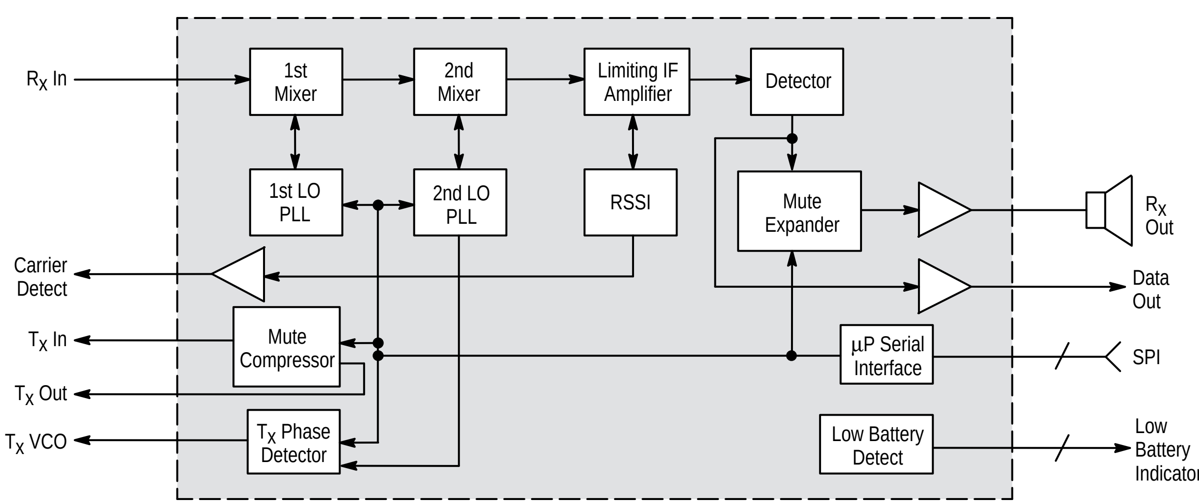
Universal Cordless Telephone Subsystem IC

MC13109FB, FTA

T_A = –40° to +85°C, Case 848B, 932

The MC13109 integrates several of the functions required for a cordless telephone into a single integrated circuit. This significantly reduces component count, board space requirements, and external adjustments. It is designed for use in both the handset and the base.

- Dual Conversion FM Receiver
  - Complete Dual Conversion Receiver – Antenna Input to Audio Output 80 MHz Maximum Carrier Frequency
  - RSSI Output
  - Carrier Detect Output with Programmable Threshold
  - Comparator for Data Recovery
  - Operates with Either a Quad Coil or Ceramic Discriminator
- Compander
  - Expandor Includes Mute, Digital Volume Control and Speaker Driver
  - Compressor Includes Mute, ALC and Limiter
- Dual Universal Programmable PLL
  - Supports New 25 Channel U.S. Standard with No External Switches
  - Universal Design for Domestic and Foreign CT–1 Standards
  - Digitally Controlled Via a Serial Interface Port
  - Receive Side Includes 1st LO VCO, Phase Detector, and 14–Bit Programmable Counter and 2nd LO with 12–Bit Counter
  - Transmit Section Contains Phase Detector and 14–Bit Counter
  - MPU Clock Output Eliminates Need for MPU Crystal
- Supply Voltage Monitor
  - Externally Adjustable Trip Point
- 2.0 to 5.5 V Operation with One–Third the Power Consumption of Competing Devices



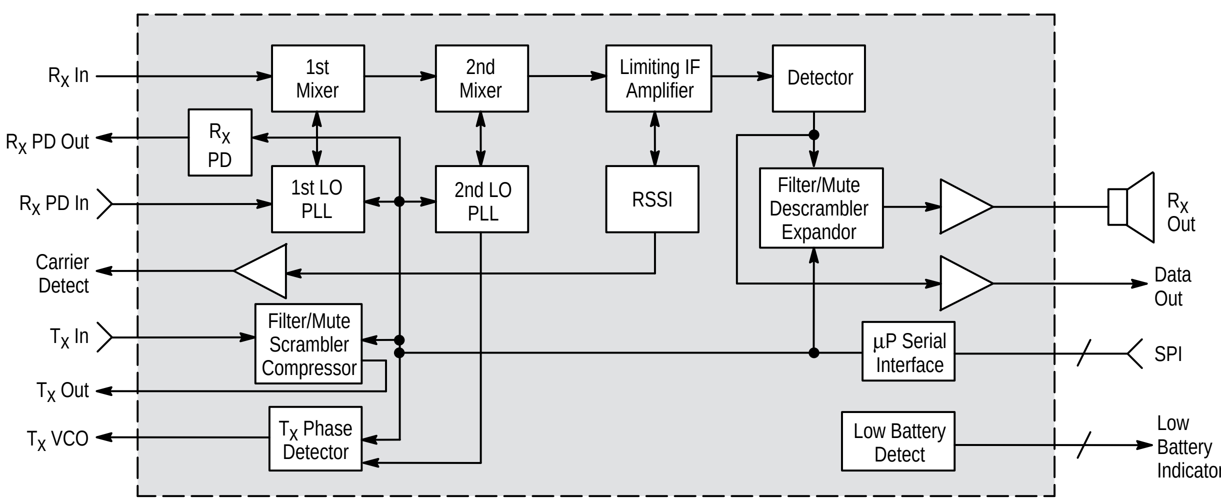
Universal Cordless Telephone Subsystem IC with Scrambler

MC13110FB

T_A = –40° to +85°C, Case 848B

The MC13110 integrates several of the functions required for a cordless telephone into a single integrated circuit. This significantly reduces component count, board space requirements, and external adjustments. It is designed for use in both the handset and the base.

- Dual Conversion FM Receiver
  - Complete Dual Conversion Receiver – Antenna In to Audio Out 80 MHz Maximum Carrier Frequency
  - RSSI Output
  - Carrier Detect Output with Programmable Threshold
  - Comparator for Data Recovery
  - Operates with Either a Quad Coil or Ceramic Discriminator
- Compander
  - Expandor Includes Mute, Digital Volume Control, Speaker Driver, 3.5 kHz Low Pass Filter, and Programmable Gain Block
  - Compressor Includes Mute, 3.5 kHz Low Pass Filter, Limiter, and Programmable Gain Block
- Dual Universal Programmable PLL
  - Supports New 25 Channel U.S. Standard with New External Switches
  - Universal Design for Domestic and Foreign CT–1 Standards
  - Digitally Controlled Via a Serial Interface Port
  - Receive Side Includes 1st LO VCO, Phase Detector, and 14–Bit Programmable Counter and 2nd LO with 12–Bit Counter
  - Transmit Section Contains Phase Detector and 14–Bit Counter
  - MPU Clock Outputs Eliminates Need for MPU Crystal
- Supply Voltage Monitor
  - Provides Two Levels of Monitoring with Separate Outputs
  - Separate, Adjustable Trip Points
- Frequency Inversion Scrambler/Descrambler
  - Can Be Enabled/Disabled Via MPU Interface
  - Programmable Carrier Modulation Frequency
- 2.7 to 5.5 V Operation with One–Third the Power Consumption of Competing Devices



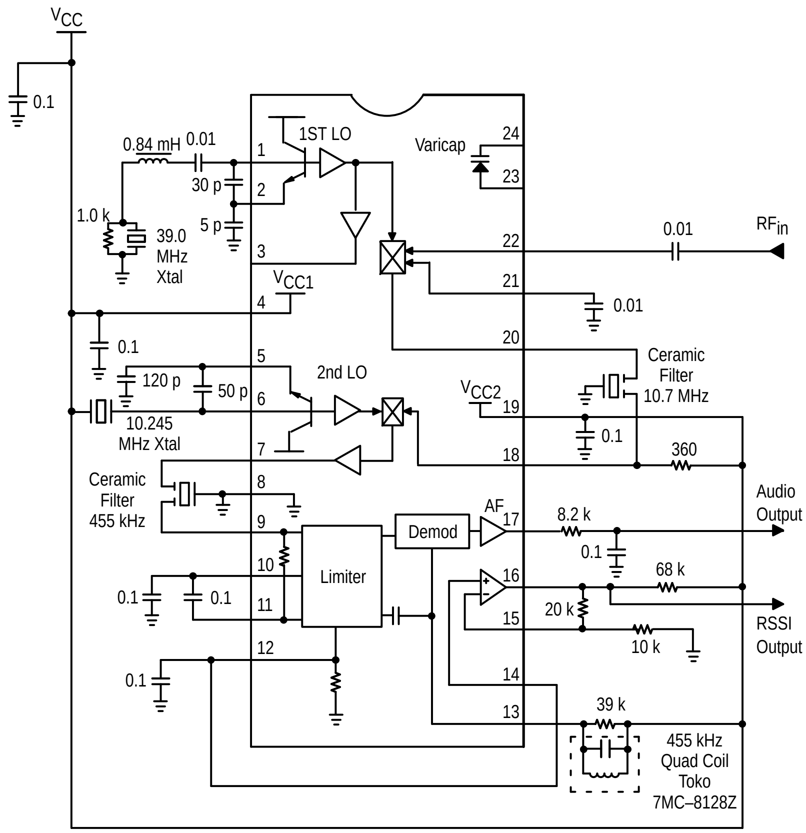
Narrowband FM Receiver

MC13135/136P, DW

T_A = –40° to +85°C, Case 724, 751E

The MC13135 is a full dual conversion receiver with oscillators, mixers, Limiting IF Amplifier, Quadrature Discriminator, and RSSI circuitry. It is designed for use in security systems, cordless phones, and VHF mobile and portable radios. Its wide operating supply voltage range and low current make it ideal for battery applications. The Received Signal Strength Indicator (RSSI) has 65 dB of dynamic range with a voltage output, and an operational amplifier is included for a dc buffered output. Also, an improved mixer third order intercept enables the MC13135 to accommodate larger input signal levels.

- Complete Dual Conversion Circuitry
- Low Voltage: 2.0 to 6.0 Vdc
- RSSI with Op Amp: 65 dB Range
- Low Drain Current: 3.5 mA Typical
- Improved First and Second Mixer 3rd Order Intercept
- Detector Output Impedance: 25 Ω Typically



Narrowband FM Coilless Detector IF Subsystem

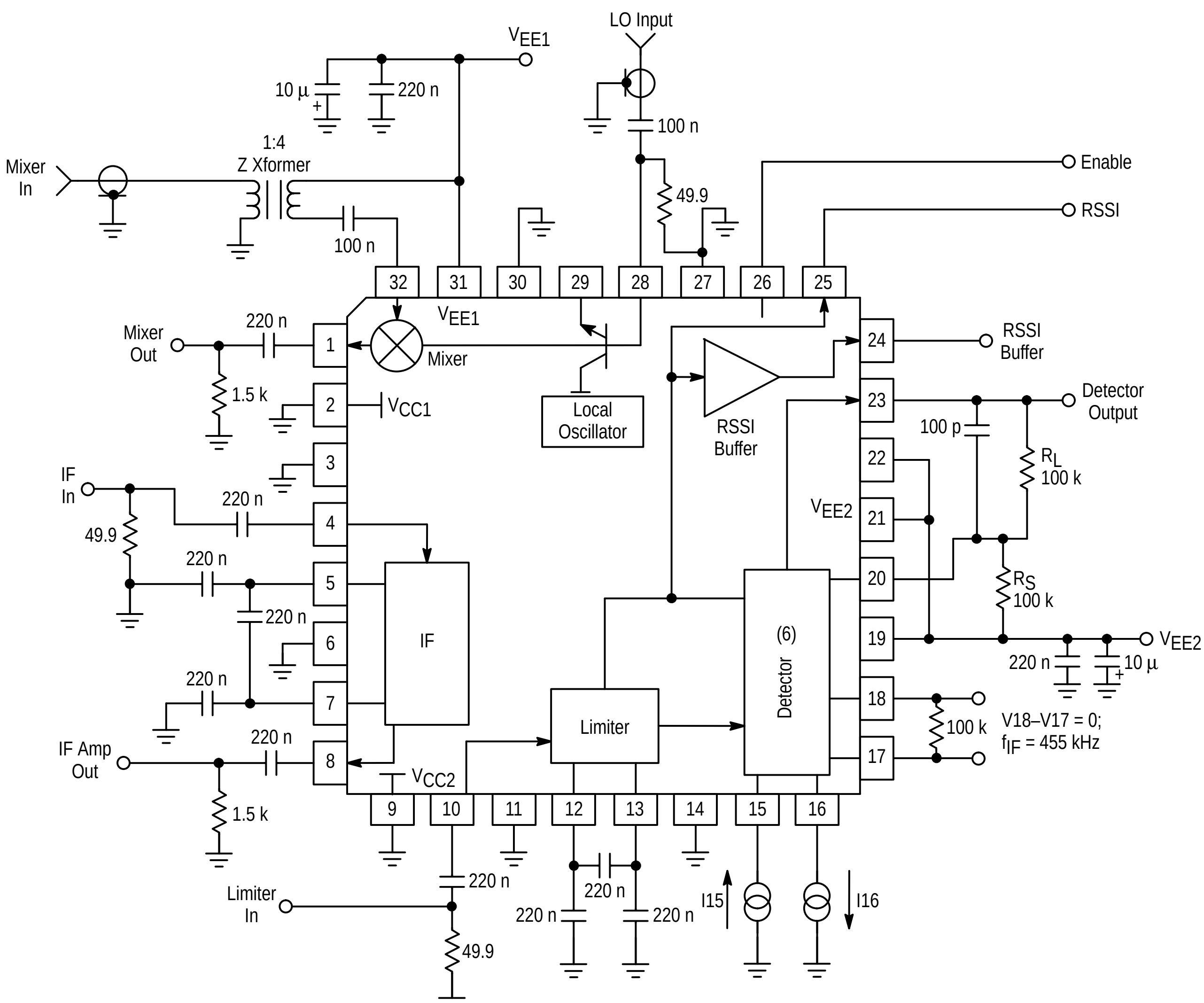
MC13150FTA, FTB

T_A = –40° to +85°C, Case 977, 873

The MC13150 is a narrowband FM IF subsystem targeted at cellular and other analog applications. Excellent high frequency performance is achieved, with low cost, through use of Motorola's MOSAIC 1.5™ RF bipolar process. The MC13150 has an onboard Colpitts VCO for Crystal controlled second LO in dual conversion receivers. The mixer is a double balanced configuration with excellent third order intercept. It is useful to beyond 200 MHz. The IF amplifier is split to accommodate two low cost cascaded filters. RSSI output is derived by summing the output of both IF sections. The quadrature detector is a unique design eliminating the conventional tunable quadrature coil.

Applications for the MC13150 include cellular, CT–1 900 MHz cordless telephone, data links and other radio systems utilizing narrowband FM modulation.

- Linear Coilless Detector
- Adjustable Demodulator Bandwidth
- 2.5 to 6.0 Vdc Operation
- Low Drain Current: < 2.0 mA
- Typical Sensitivity of 2.0 µV for 12 dB SINAD
- IIP3, Input Third Order Intercept Point of 0 dBm
- RSSI Range of Greater Than 100 dB
- Internal 1.4 kΩ Terminations for 455 kHz Filters
- Split IF for Improved Filtering and Extended RSSI Range



Wideband FM IF System

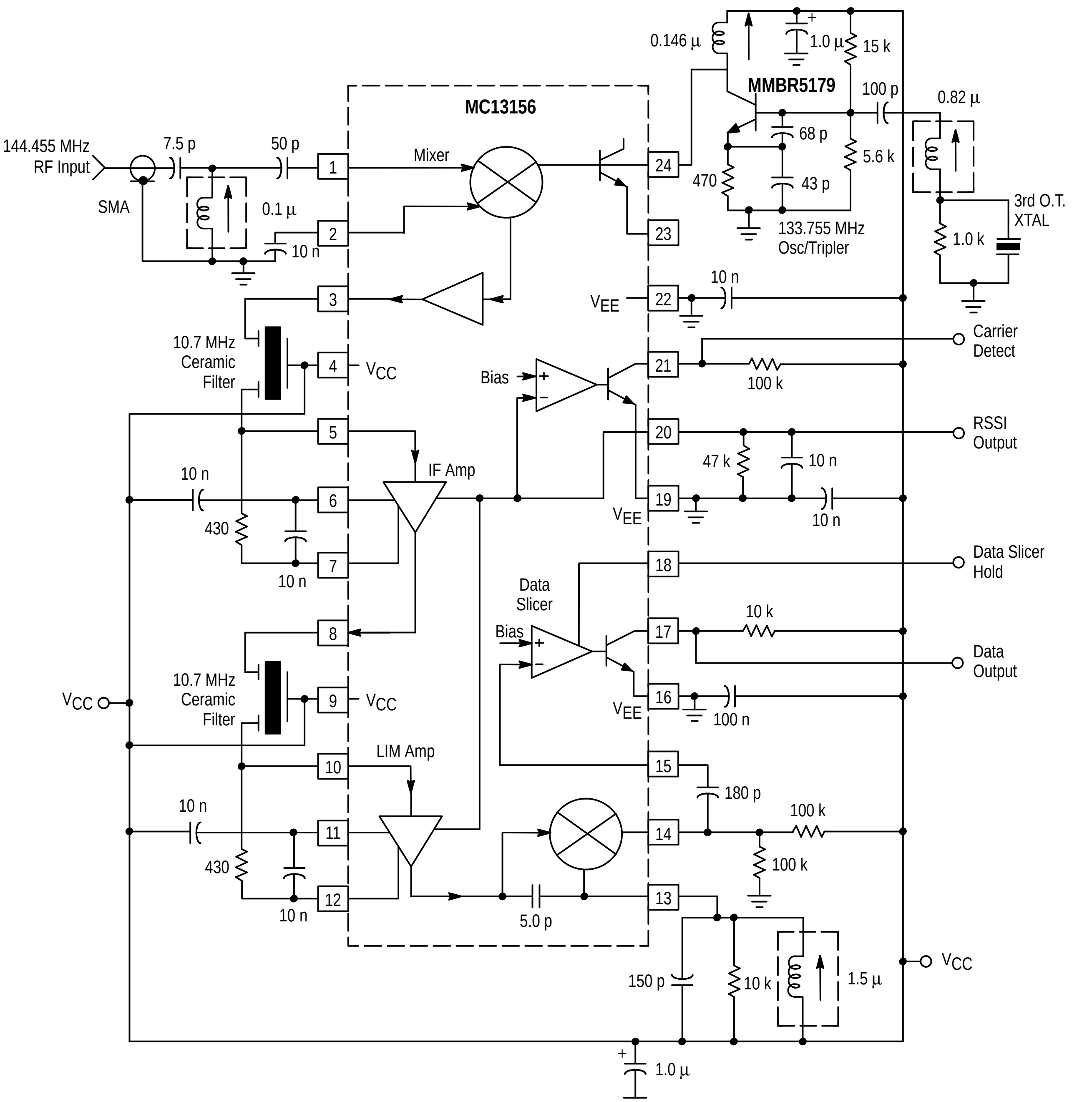
MC13156DW, FB

T_A = –40° to +85°C, Case 751E, 873

The MC13156 is a wideband FM IF subsystem targeted at high performance data and analog applications. Excellent high frequency performance is achieved, with low cost, through use of Motorola's MOSAIC 1.5™ RF bipolar process. The MC13156 has an onboard Colpitts VCO for PLL controlled multichannel operation. The mixer is useful to beyond 200 MHz and may be used in a differential, balanced, or single–ended configuration. The IF amplifier is split to accommodate two low cost cascaded filters. RSSI output is derived by summing the output of both IF sections. A precision data shaper has a hold function to preset the shaper for fast recovery of new data.

Applications for the MC13156 include CT–2, wideband data links, and other radio systems utilizing GMSK, FSK or FM modulation.

- 2.0 to 6.0 Vdc Operation
- Typical Sensitivity of 6.0 µV for 12 dB SINAD
- RSSI Dynamic Range Typically 80 dB
- High Performance Data Shaper for Enhanced CT–2 Operation
- Internal 300 Ω and 1.4 kΩ Terminations for 10.7 MHz and 455 kHz Filters
- Split IF for Improved Filtering and Extended RSSI Range



Wideband FM IF Subsystem

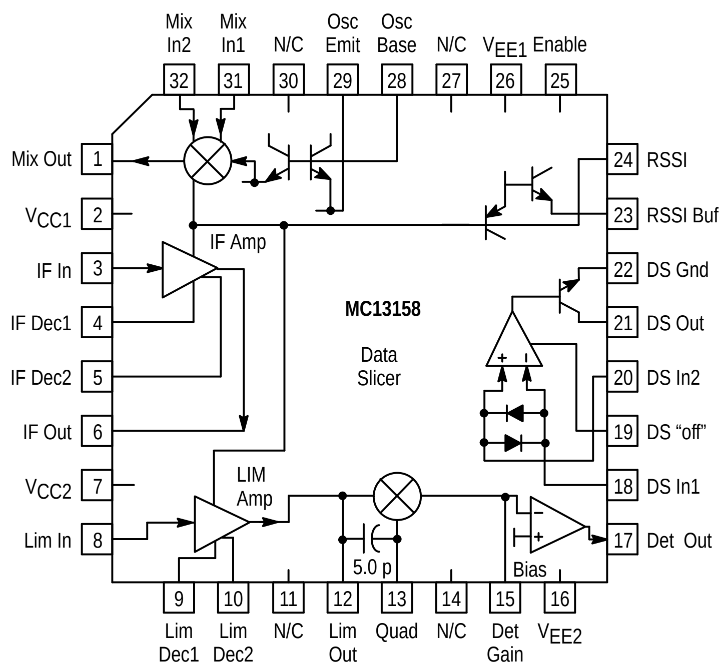
MC13158FTB

T_A = –40° to +85°C, Case 873

The MC13158 is a wideband IF subsystem that is designed for high performance data and analog applications. Excellent high frequency performance is achieved, with low cost, through the use of Motorola's MOSAIC 1.5™ RF bipolar process. The MC13158 has an on–board grounded collector VCO transistor that may be used with a fundamental or overtone crystal in single channel operation or with a PLL in multi–channel operation. The mixer is useful to 500 MHz and may be used in a balanced differential or single ended configuration. The IF amplifier is split to accommodate two low cost cascaded filters. RSSI output is derived by summing the output of both IF sections. A precision data shaper has an Off function to shut the output "off" to save current. An enable control is provided to power down the IC for power management in battery operated applications.

Applications include DECT, wideband wireless data links for personal and portable laptop computers and other battery operated radio systems which utilize GFSK, FSK or FM modulation.

- Designed for DECT Applications
- 1.8 to 6.0 Vdc Operating Voltage
- Low Power Consumption in Active and Standby Mode
- Greater than 600 kHz Detector Bandwidth
- Data Slicer with Special Off Function
- Enable Function for Power Down of Battery Operated Systems
- RSSI Dynamic Range of 80 dB Minimum
- Low External Component Count



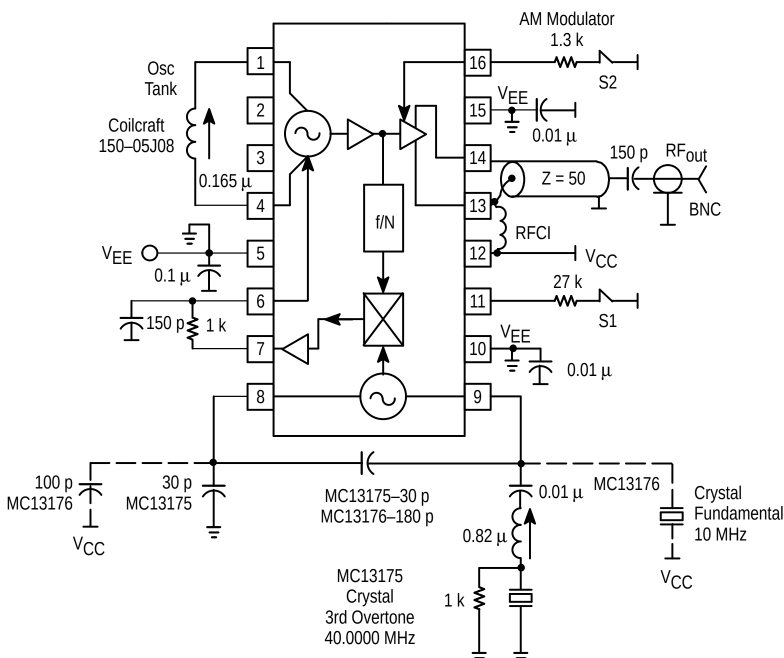
UHF, FM/AM Transmitter

MC13175/176D

T_A = 0° to +70°C, Case 751B

The MC13175 and MC13176 are one chip FM/AM transmitter subsystems designed for AM/FM communication systems operating in the 260 to 470 MHz band covered by FCC Title 47; Part 15. They include a Colpitts crystal reference oscillator, UHF oscillator, ÷8 (MC13175) or ÷32 (MC13176) prescaler, and phase detector forming a versatile PLL system. Another application is as a local oscillator in a UHF or 900 MHz receiver. MC13175/176 offer the following features:

- UHF Current Controlled Oscillator
- Use Easily Available 3rd Overtone or Fundamental Crystals for Reference
- Low Number of External Parts Required
- Low Operating Supply Voltage (1.8 – 5 Vdc)
- Low Supply Drain Currents
- Power Output Adjustable (Up to +10 dBm)
- Differential Output for Loop Antenna or Balun Transformer Networks
- Power Down Feature
- ASK Modulated by Switching Output “On”/“Off”
- MC13175 – f_o = 8 × f_{ref}
- MC13176 – f_o = 32 × f_{ref}



Telecommunications

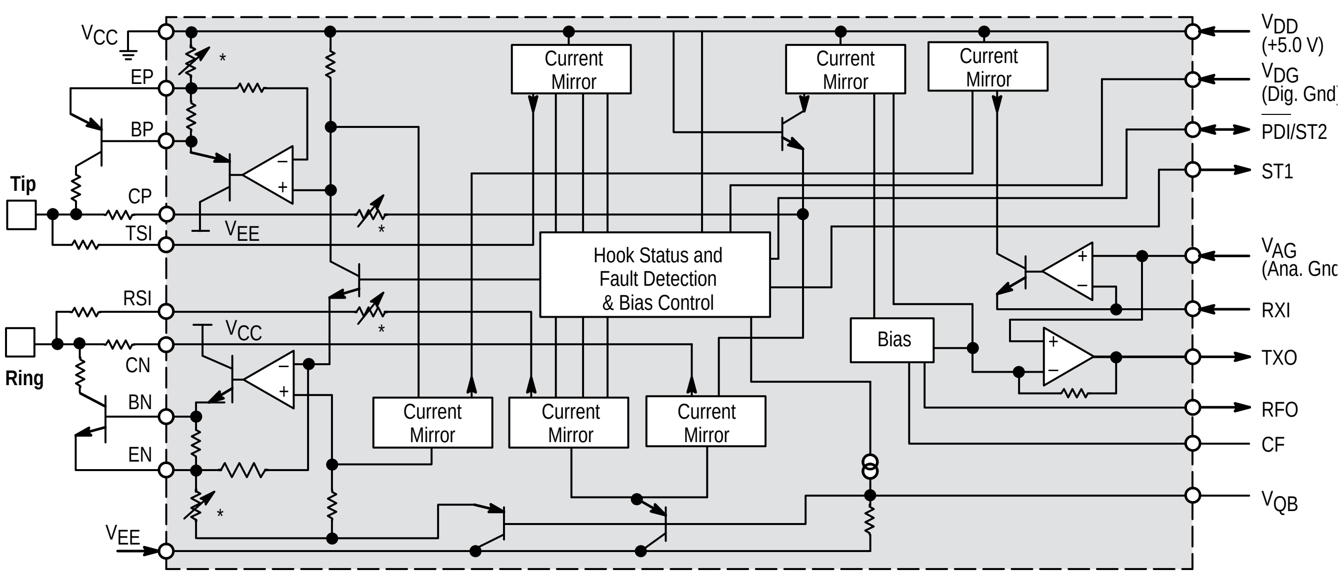
Subscriber Loop Interface Circuit (SLIC)

MC33120/1P, FN

T_A = –40° to +85°C, Case 738, 776

With a guaranteed minimum longitudinal balance of 58 dB, the MC33120/1 is ideally suited for Central Office applications, as well as PBXs, and other related equipment. Protection and sensing components on the two–wire side can be non–precision while achieving required system performance. Most BORSHT functions are provided while maintaining low power consumption, and a cost effective design. Size and weight reduction over conventional transformer designs permit a higher density system.

- All Key Parameters Externally Programmable with Resistors:
  - Transmit and Receive Gains
  - Transhybrid Loss
  - Return Loss
  - DC Loop Current Limit and Battery Feed Resistance
  - Longitudinal Impedance
- Single and Double Fault Sensing and Protection
- Minimum 58 dB Longitudinal Balance (2–wire and 4–wire) Guaranteed
- Digital Hook Status and Fault Outputs
- Power Down Input
- Loop Start or Ground Start Operation
- Size & Weight Reduction Over Conventional Approaches
- Available in 20 Pin DIP and 28 Pin PLCC Packages
- Battery Voltage: –42 to –58 V (for MC33120),
  –21.6 to –42 V (for MC33121)



(Battery)

* Indicates Trimmed Resistor

PBX Architecture (Analog Transmission)

PCM Mono–Circuits Codec–Filters (CMOS LSI)

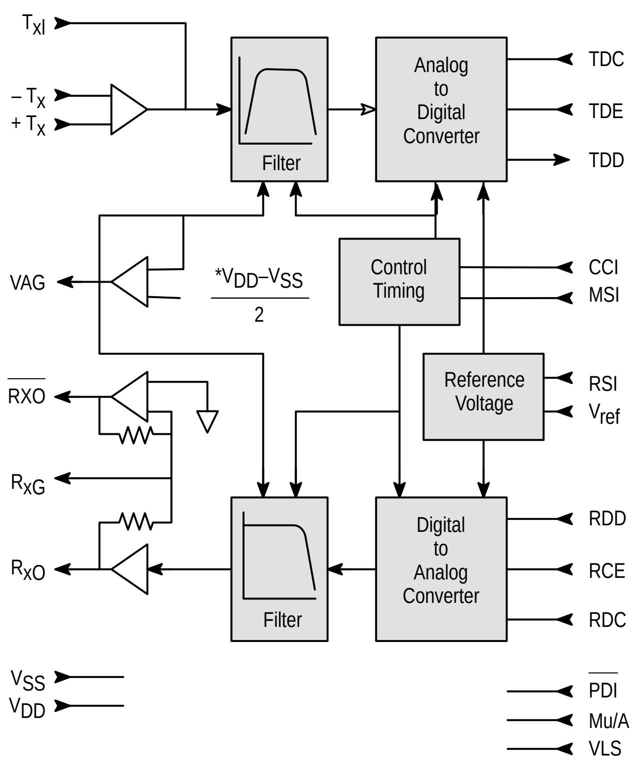
MC145500 Series

Case 648, 708, 751G, 776

The Mono–circuits perform the digitizing and restoration of the analog signals. In addition to these important functions, Motorola's family of pulse–code modulation mono–circuits also provides the band–limiting filter functions – all on a single monolithic CMOS chip with extremely low power dissipation.

The Mono–circuits require no external components. They incorporate the bandpass filter required for antialiasing and 60 Hz rejection, the A/D–D/A conversion functions for either U.S. Mu–Law or European A–Law companding formats, the low–pass filter required for reconstruction smoothing, an on–board precision voltage reference, and a variety of options that lend flexibility to circuit implementations. Unique features of Motorola's Mono–circuit family include wide power supply range (6.0 to 13 V), selectable on–board voltage reference (2.5, 3.1, or 3.8 V), and TTL or CMOS I/O interface.

Motorola supplies three versions in this series. The MC145503 and MC145505 are general–purpose devices in 16 pin packages designed to operate in digital telephone or line card applications. The MC145502 is the full–feature device that presents all of the options available on the chip. This device is packaged in a 22 pin DIP and 28 pin chip carrier package.



MC145554/57/64/67

Case 648, 751D, 751G, 738

These per channel PCM Codec–Filters perform the voice digitization and reconstruction as well as the band limiting and smoothing required for PCM systems. They are designed to operate in both synchronous and asynchronous applications and contain an on–chip precision voltage reference. The MC145554 (Mu–Law) and MC145557 (A–Law) are general purpose devices that are offered in 16 pin packages. The MC145564 (Mu–Law) and MC145567 (A–Law), offered in 20 pin packages, add the capability of analog loop–back and push–pull power amplifiers with adjustable gain.

All four devices include the transmit bandpass and receive lowpass filters on–chip, as well as active RC pre–filtering and post–filtering. Fully differential analog circuit design assures lowest noise. Performance is specified over the extended temperature range of –40° to +85°C.

These PCM Codec–Filters accept both industry standard clock formats. They also maintain compatibility with Motorola's family of MC3419/MC33120 SLIC products.

MC145480P, DW, SD

Case 738, 751D, 940C

This 5.0 V, general purpose per channel PCM Codec–Filter offers selectable Mu–Law or A–Law companding in 20 pin DIP, SOG and SSOP packages. It performs the voice digitization and reconstruction as well as the band limiting and smoothing required for PCM systems. It is designed to operate in both synchronous and asynchronous applications and contains an on–chip precision reference voltage (1.575 V).

The transmit bandpass and receive lowpass filters, and the active RC pre–filtering and post–filtering are incorporated, as well as fully differential analog circuit design for lowest noise. Push–pull 300 Ω power drivers with external gain adjust are also included.

The MC145480 PCM Codec–Filter accepts a variety of clock formats, including short–frame sync, long–frame sync, IDL, and GCI timing environments. This device also maintains compatibility with Motorola's family of Telecom products, including the MC145472 U–Interface Transceiver, MC145474/75 S/T–Interface Transceiver, MC145532 ADPCM Transcoder, MC145422/26 UDLT–I, MC145421/25 UDLT–II, and MC3419/MC33120 SLIC.

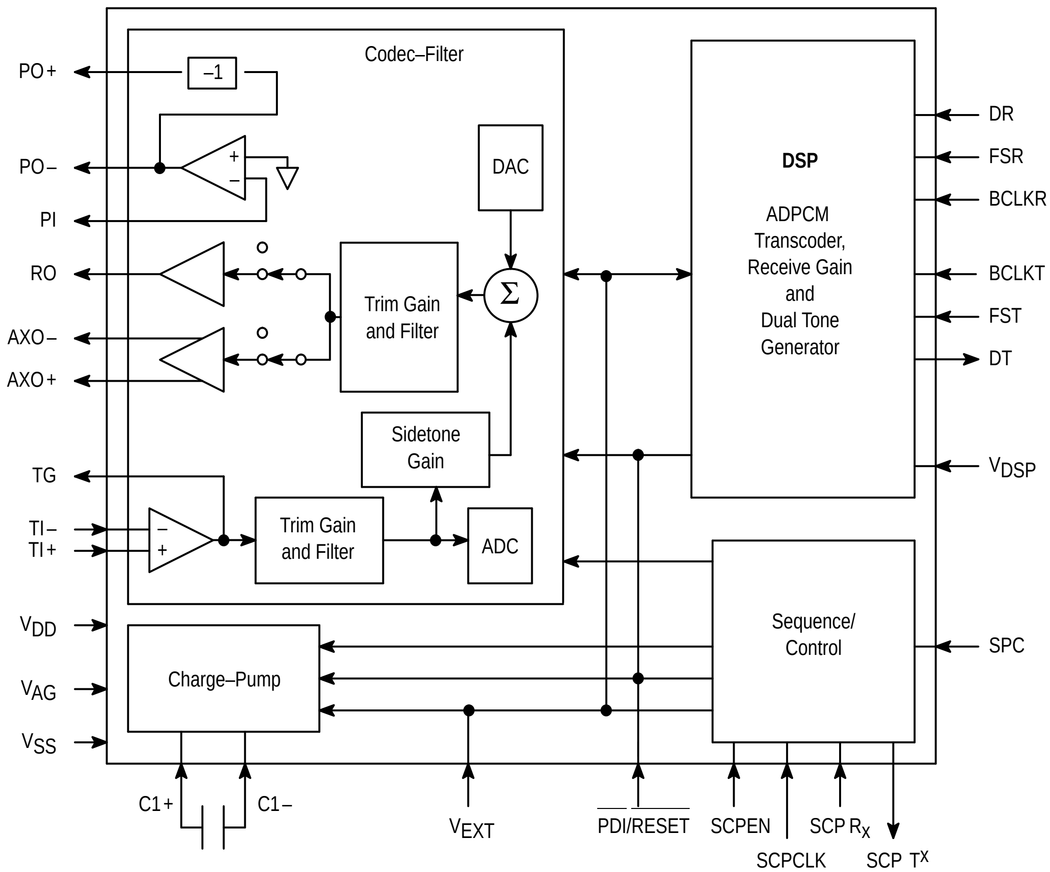
MC14LC5540P, DW, FU

Case 710, 751F, 873

The MC14LC5540 ADPCM Codec is a single chip implementation of a PCM Codec–Filter and an ADPCM encoder/decoder, and therefore provides an efficient solution for applications requiring the digitization and compression of voiceband signals. This device is designed to operate over a wide voltage range, 2.7 V to 5.25 V, and as such is ideal for battery powered as well as ac powered applications. The MC14LC5540 ADPCM Codec also includes a serial control port and internal control and status registers that permit a microcomputer to exercise many built–in features.

The ADPCM Codec is designed to meet the 32 kbps ADPCM conformance requirements of CCITT Recommendation G.721 (1988) and ANSI T1.301 (1987). It also meets ANSI T1.303 and CCITT Recommendation G.723 for 24 kbps ADPCM operation, and the 16 kbps ADPCM standard, CCITT Recommendation G.726. This device also meets the PCM conformance specification of the CCITT G.714 Recommendation.

Figure 1. MC14LC5540 ADPCM Codec Block Diagram



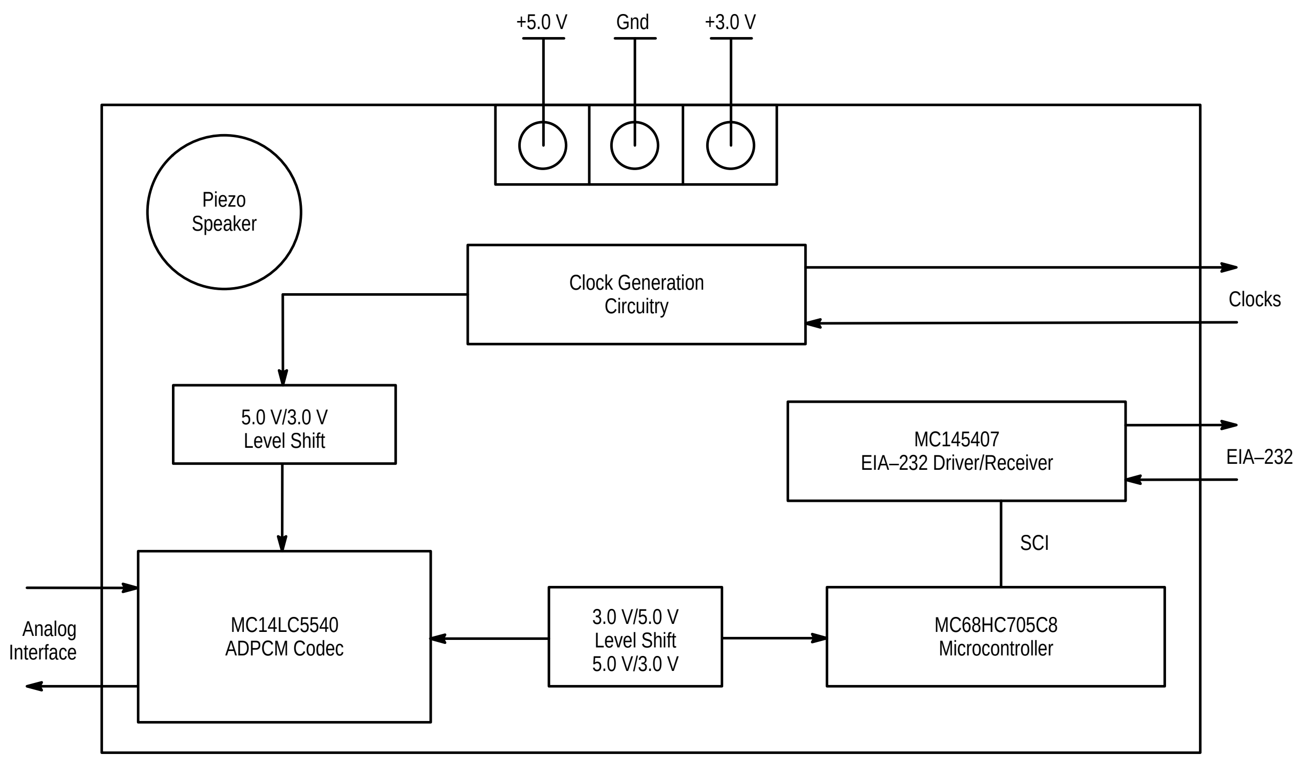
MC145537EVK

ADPCM Codec Evaluation Kit

The MC145537EVK is the primary tool for evaluation and demonstration of the MC14LC5540 ADPCM Codec. It provides the necessary hardware and software interface to access the many features and operational modes of the MC14LC5540 ADPCM Codec.

- Provides Stand Alone Evaluation on Single Board
- The kit provides Analog–to–Analog, Analog–to–Digital or Digital–to–Analog Connections – with Digital Connections being 64 kbps PCM, 32 or 24 kbps ADPCM, or 16 kbps CCITT G.726 or Motorola Proprietary ADPCM
- +5.0 V Only Power Supply, or 5.0 V Plus 2.7 to 5.25 V Supply
- Easily Interfaced to Test Equipment, Customer System, Second MC145537EVK or MC145536EVK (5.0 V Only) for Full Duplex Operation
- Convenient Access to Key Signals
- Piezo Loudspeaker
- EIA–232 Serial Computer Terminal Interface for Control of the MC14LC5540 ADPCM Codec Features
- Compatible Handset Provided
- Schematics, Data Sheets, and User's Manual Included

Figure 2. MC145537EVK Block Diagram

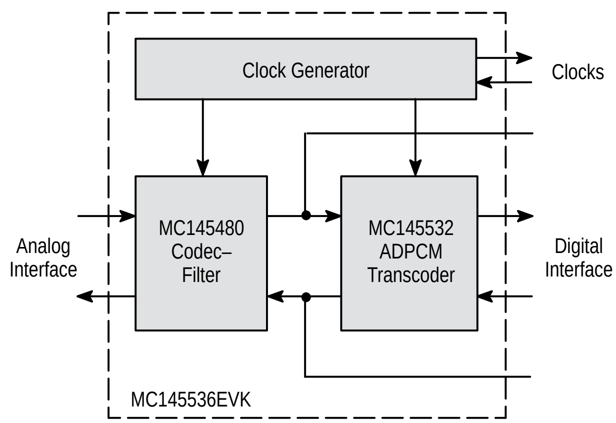


MC145536EVK

Codec–Filter/ADPCM Transcoder Evaluation Kit

The MC145536EVK is the primary tool for evaluation and demonstration of the MC145480 Single +5.0 V supply PCM Codec–Filter and the MC145532 ADPCM Transcoder (see "Telephone Accessory Circuits"). The MC145536EVK provides the necessary hardware needed to evaluate the many separate operating modes under which the MC145480 and MC145532 are intended to operate.

- Provides Stand Alone Evaluation on a Single Board
- Easily Interfaced to Test Equipment, Customer System, or Second MC145536EVK
- Convenient Access to Key Signals
- Generous Wire–Wrap Area for Application Development
- The kit provides Analog–to–Analog, Analog–to–Digital, or Digital–to–Analog Connections – with Digital Connections Being 64 kbps PCM; 32, 24, or 16 kbps Motorola Proprietary ADPCM
- Compatible Handset Included
- Schematics, Data Sheets, and User's Manual included



Dual Tone Multiple Frequency Receiver

MC145436AP, DW

Case 646, 751G

This device contains the filter and decoder for detection of a pair of tones conforming to the DTMF standard with outputs in hexadecimal. Switched capacitor filter technology is used together with digital circuitry for the timing control and output circuits. The MC145436A provides excellent power–line noise and dial tone rejection.

Replaces MC145436P, DW.

ISDN Voice/Data Circuits

Integrated Services Digital Network

ISDN is the revolutionary concept of converting the present analog telephone networks to an end–to–end global digital network. ISDN standards make possible a wide variety of services and capabilities that are revolutionizing communications in virtually every industry.

Motorola's ISDN product family includes the MC14LC5472 and MC145572 U–Interface Transceivers, the MC145474/75 and MC145574 S/T–Interface Transceivers, MC145488 Dual Data Link Controller, and the MC68302 Integrated Multi–Protocol Processor. These are supported by a host of related devices including the MC145480 +5.0 V PCM Codec–Filter, MC145532 ADPCM Transcoder, MC14LC5540 ADPCM Codec, MC145500 family of single–chip codec/filters, MC145436A DTMF Decoder, MC33120 Subscriber Loop Interface Circuit, MC34129 Switching Power Supply Controller, and the MC145406/07 CMOS EIA 232–E Driver/ Receiver family.

Motorola's key ISDN devices fit into four ISDN network applications: a digital subscriber line card, an NT1 network termination, an ISDN terminal adapter, and an ISDN terminal. Digital subscriber line cards are used in central offices, remote concentrators, channel banks, T1 multiplexers, and other switching equipment. The NT1 network termination block illustrates the simplicity of remote U– to S/T–interface conversion. The ISDN terminal adapter and ISDN terminal block show how Motorola ICs are used to combine voice and data in PC compatible boards, digital telephones, and other terminal equipment. Expanded applications such as a PBX may include these and other Motorola ISDN circuits. Many "non–ISDN" uses, such as pairgain applications, are appropriate for Motorola's ISDN devices as well.

Second Generation U–Interface Transceivers

MC145572PB

Case 842D

MC145572FN

Case 777

The MC145572 fully conforms to ANSI T1.601–1992, the North American standard for ISDN Basic Access on a single twisted–wire pair. The transceiver achieves a remarkable 10^{-7} bit error rate performance on all ANSI specified test loops with worst–case impairments present. The state–of–the–art 0.65 micron single–chip solution uses advanced design techniques to combine precision analog signal processing elements with three digital signal coprocessors to build an adaptively equalized echo cancelling receiver.

Two modes of handling U–interface maintenance functions are provided on the MC145572. In the automatic maintenance mode the U–interface transceiver handles all ANSI specified maintenance and channel procedures internally to minimize your software development effort. Automatic procedures include generating and monitoring the cyclic redundancy check, reporting and counting far end block errors (near end block errors too), handling the ACT and DEA bits, as well as monitoring and appropriately responding to embedded operations channel messages.

The MC145572 has 275 mW maximum power dissipation. It also has an enhanced TDM interface that supports an on–chip timeslot assigner, GCI and IDL modes of operation.

The optional manual maintenance mode lets you choose an inexpensive microcontroller, such as a member of Motorola's MC68HC05 family, to control and augment the standard maintenance channel functions. This flexible feature also allows for easy implementation of proprietary maintenance functions.

Second Generation S/T–Interface Transceivers

MC145574PB

Case 736B

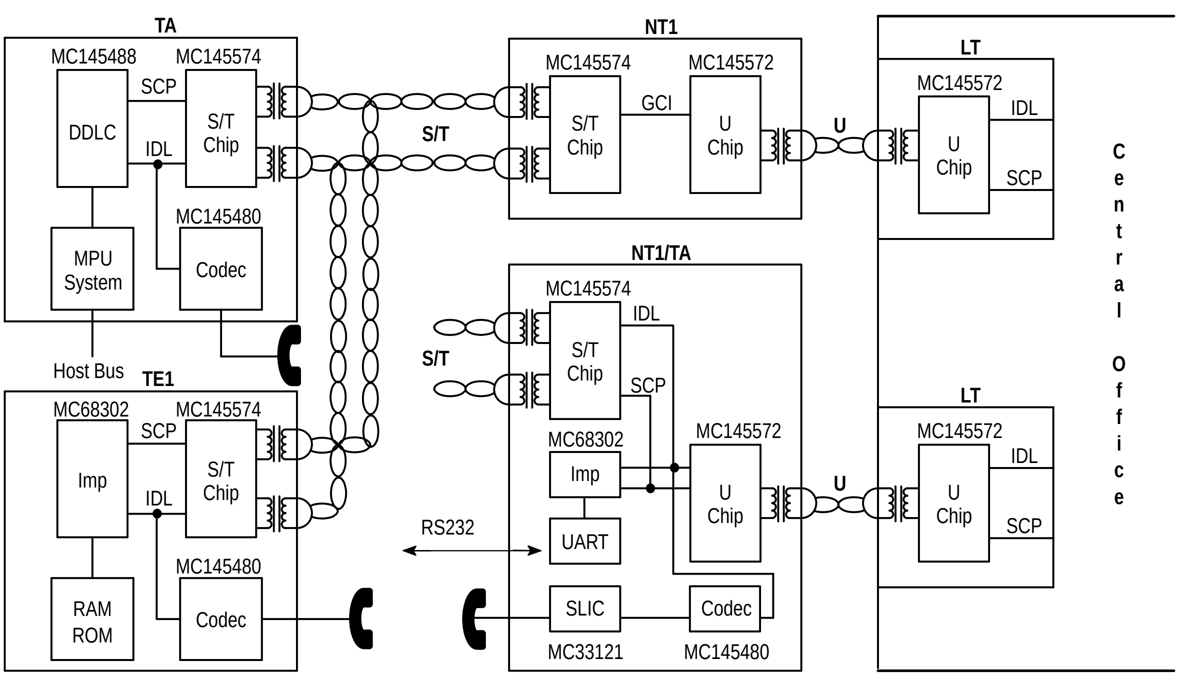
MC145574DW

Case 837A

The MC145574 S/T–Interface Transceivers provide a CCITT I.430 compatible interface for use in line card, network termination, and ISDN terminal equipment applications. Manufactured with Motorola's advanced 0.65 micron CMOS mixed analog and digital process technology, the MC145574 is a physical layer device capable of operating in point–to–point or point–to–multipoint passive bus arrangements. In addition, the MC145574 implements the optional NT1 Star topology, NT terminal mode and TE slave mode.

This device features outstanding transmission performance. It reliably transmits over 1 kilometer in a point–to–point application. Comparable performance is achieved in all other topologies as well. Other features include pin selectable terminal or network operating modes, industry standard microprocessor serial control port, full support of the multiframing S and Q channels, a full range of loopbacks, and low power CMOS operation, with a maximum power consumption of 90 mW.

The MC145574 has an enhanced TDM interface that supports GCI, IDL and an on–chip timeslot assigner.



Dual Data Link Controller

MC145488FN
Case 779

The MC145488 features two full–duplex serial HDLC channels with an on–chip Direct Memory Access (DMA) controller. The DMA controller minimizes the number of microprocessor interrupts from the communications channels, freeing the microprocessor's resources for other tasks. The DMA controller can access up to 64 kbytes of memory, and transfers either 8–bit bytes or 16–bit words to or from memory. The MC145488 DDLC is compatible with Motorola's MC68000 and other microprocessors.

In a typical ISDN terminal application, one DDLC communications channel supports the D–channel (LAPD) while the other supports the B–channel (LAPB). While the DDLC is ideally suited for ISDN applications, it can support many other HDLC protocol applications as well.

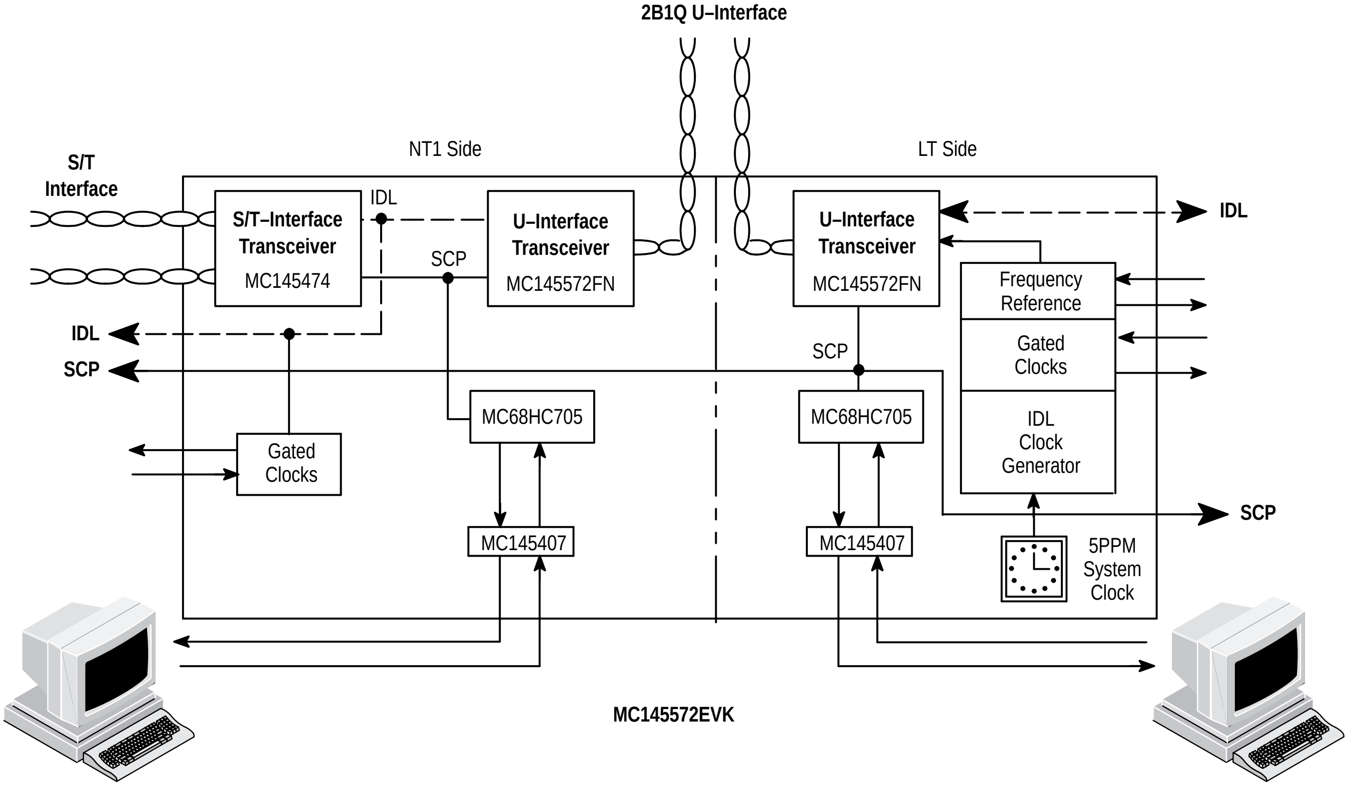
Some of the powerful extras found on the DDLC include automatic abort and retransmit of D–channel collisions in S/T–interface applications, address recognition, automatic recovery mechanisms for faulty frame correction, and several system test modes. Address recognition provides a reduction in the host microprocessor load by filtering data frames not addressed to the host. The DDLC can compare either SAPI or TEI fields of LAPD frames. For LAPD (Q.921) applications, both A and B addresses may be checked.

MC14LC5494EVK
U–Interface Transceiver Evaluation Kit discontinued

MC145572EVK
U–Interface Transceiver Evaluation Kit

This kit provides the hardware and software to evaluate the many configurations under which the MC145572EVK is able to operate. Used as a whole, it operates as both ends of the two–wire U interface that extends from the customer premises (NT1) to the switch line card (LT). The two halves of the board can be physically and functionally separated, providing independent NT1 and LT evaluation capability.

The kit provides the ability to interactively manipulate status registers in the MC145572EVK U–Interface transceiver or in the MC145474/75 S/T–Interface transceiver with the aid of an external terminal. The device can also be controlled using the MC68302 Integrated Multiprotocol Processor application development system to complete a total Basic Rate ISDN evaluation solution.



MC145572EVK

Voice/Data Communication (Digital Transmission)

2–Wire Universal Digital Loop Transceiver (UDLT)

MC145422P, DW Master Station
Case 708, 751E

MC145426P, DW Slave Station
Case 708, 751E

The UDLT family of transceivers allows the use of existing twisted–pair telephone lines (between conventional telephones and a PBX) for the transmission of digital data. With the UDLT, every voice–only telephone station in a PBX system can be upgraded to a digital telephone station that handles the complex voice/data communications with no increase in cabling costs.

In implementing a UDLT–based system the A/D to D/A conversion function associated with each telset is relocated from the PBX directly to the telset. The SLIC (or its equivalent circuit) is eliminated since its signaling information is transmitted digitally between two UDLTs.

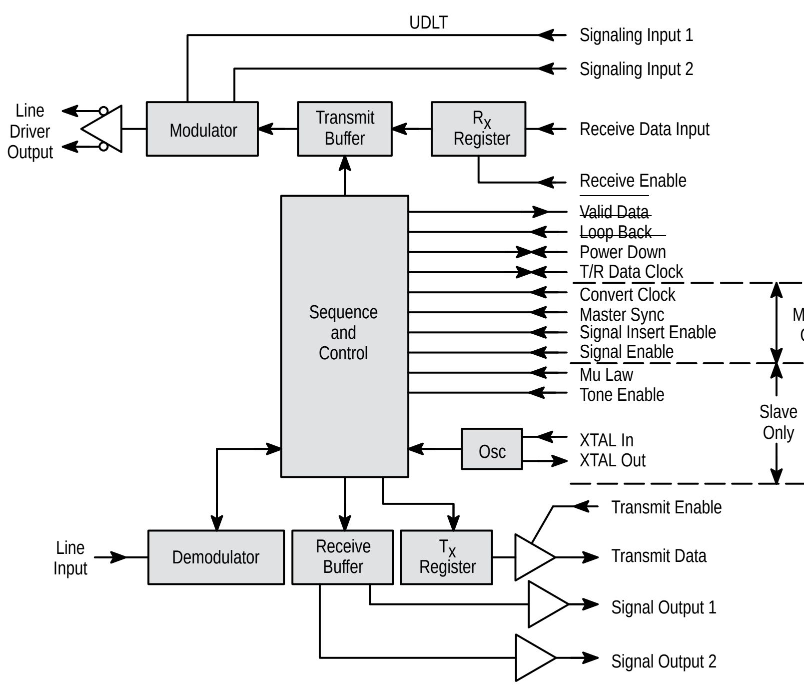
The UDLT master–slave system incorporates the modulation/demodulation functions that permit data communications over a distance up to 2 kilometers. It also provides the sequence control that governs the exchange of information between master and slave. Specifically, the master resides on the PBX line card where it transmits and receives data over the wire pair to the telset. The slave is located in the telset and interfaces the mono–circuit to the wire pair. Data transfer occurs in 10–bit bursts (8 bits of data and 2 signaling bits), with the master transmitting first, and the slave responding in a synchronized half–duplex transmission format.

UDLTs utilize a 256 kilobaud Modified Differential Phase Shift Keyed (MDPSK) burst modulation technique for transmission to minimize radio frequency, electromagnetic, and crosstalk interference. Implementation through CMOS technology takes advantage of low–power operation, increased reliability, and the proven capabilities to perform complex telecommunications functions.

Functional Features
- Provides Synchronous Duplex 64 kbits/Second Voice/Data Channel and Two 8 kbits/Second Signaling Data Channels Over One 26 AWG Wire Pair Up to 2 km.
- Compatible with Existing and Evolving Telephone Switch Architectures and Call Signaling Schemes
- Automatic Detection Threshold Adjustment for Optimum Performance Over Varying Signal Attenuations
- Protocol Independent
- Single 5.0 V to 8.0 V Power Supply

MC145422 Master UDLT
- 2.048 MHz Master Clock
- Pin Controlled Power–Down and Loop–Back Features
- Variable Data Clock – 64 kHz to 2.56 MHz
- Pin Controlled Insertion/Extraction of 8 kbits/Seconds Channel into LSB of 64 kbits/Second Channel for Simultaneous Routing of Voice and Data Through PCM Voice Path of Telephone Switch

MC145426 Slave UDLT
- Compatible with MC145500 Series and Later PCM Mono–Circuits
- Automatic Power–Up/Down Feature
- On–Chip Data Clock Recovery and Generation
- Pin Controlled 500 Hz D3 or CCITT Format PCM Tone Generator for Audible Feedback Applications



2–Wire ISDN Universal Digital Loop Transceiver II (UDLT II)

MC145421P, DW Master

Case 709, 751E

MC145425P, DW Slave

Case 709, 751E

Similar to the MC145422/26 UDLT, but provide synchronous full duplex 160 kbps voice and data communication in a 2B + 2D format for ISDN compatibility on a single twisted pair up to 1 km. Single 5.0 V power supply, protocol independent.

Electronic Telephone

The Complete Electronic Telephone Circuit

MC34010P, FN

T_A = –20° to +60°C, Case 711, 777

The conventional transformer–driven telephone handset is undergoing major innovations. The bulky transformer is disappearing. So are many of its discrete components, including the familiar telephone bell. They are being replaced with integrated circuits that perform all the major handset functions simply, reliably and inexpensively . . . functions such as 2–to–4 wire conversion, DTMF dialing, tone ringing, and a variety of related activities.

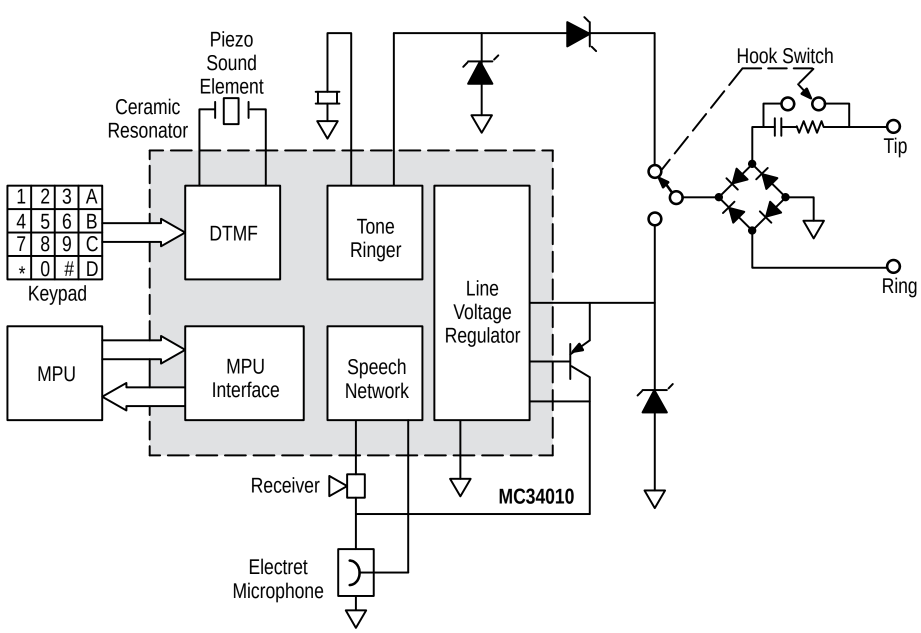
The culmination of these capabilities is the Electronic Telephone Circuit, the MC34010. These ICs place all of the above mentioned functions on a single monolithic chip.

These telephone circuits utilize advanced bipolar analog (I^2L) technology and provide all the necessary elements of a modern tone–dialing telephone. The MC34010 even incorporates an MPU interface circuit for the inclusion of automatic dialing in the final system.

- Provides all basic telephone functions, including DTMF dialer, tone ringer, speech network and line voltage regulator
- DTMF generator uses low cost ceramic resonator with accurate frequency synthesis technique
- Tone ringer drives piezoelectric transducer and satisfies EIA–470 requirements
- Speech network provides 2–to–4 wire conversion with adjustable sidetone utilizing an electret transmitter
- On–chip regulator insures stable operation over wide range of loop lengths
- I^2L technology provides low 1.4 V operation and high static discharge immunity
- Microprocessor interface port for automatic dialing features

Also Available

A broad line of additional telephone components for customizing systems design.



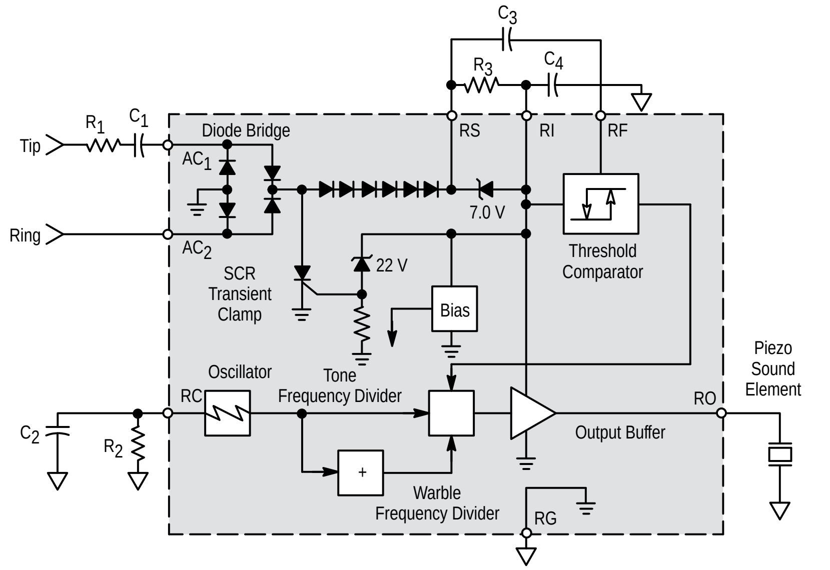
Tone Ringers

The MC34012, MC34017, and MC34117 Tone Ringers are designed to replace the bulky bell assembly of a telephone, while providing the same function and performance under a variety of conditions. The operational requirements spelled out by the FCC and EIA–470, simply stated, are that a ringer circuit MUST function when a ringing signal is provided, and MUST NOT ring when other signals (speech, dialing, noise) are on the line. The tone ringers described below were designed to meet those requirements with a minimum of external components.

MC34012P, D

T_A = –20° to +60°C, Case 626, 751

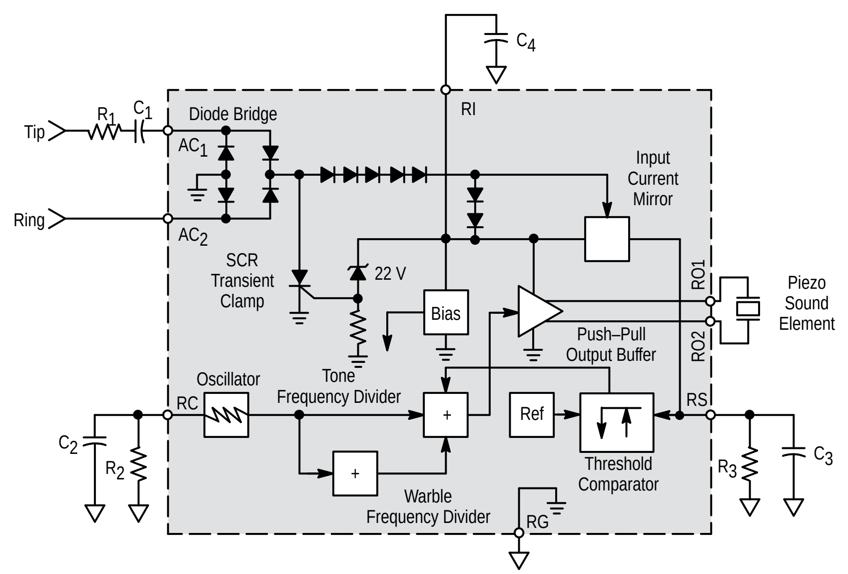
- Complete Telephone Bell Replacement
- On–Chip Diode Bridge and Transient Protection
- Single–Ended Output to Piezo Transducer
- Input Impedance Signature Meets Bell and EIA Standards
- Rejects Rotary Dial and Hook Switch Transients
- Adjustable Base Frequencies
- Output Frequency to Warble Ratio –
  MC34012–1:80
  MC34012–2:160
  MC34012–3:40



MC34017P, D

T_A = –20° to +60°C, Case 626, 751

- Complete Telephone Bell Replacement
- On–Chip Diode Bridge and Transient Protection
- Differential Output to Piezo Transducer for Louder Sound
- Input Impedance Signature Meets Bell and EIA Standards
- Rejects Rotary Dial and Hook Switch Transients
- Output Frequency to Warble Ratio –
  MC34017–1:80
  MC34017–2:160
  MC34017–3:40

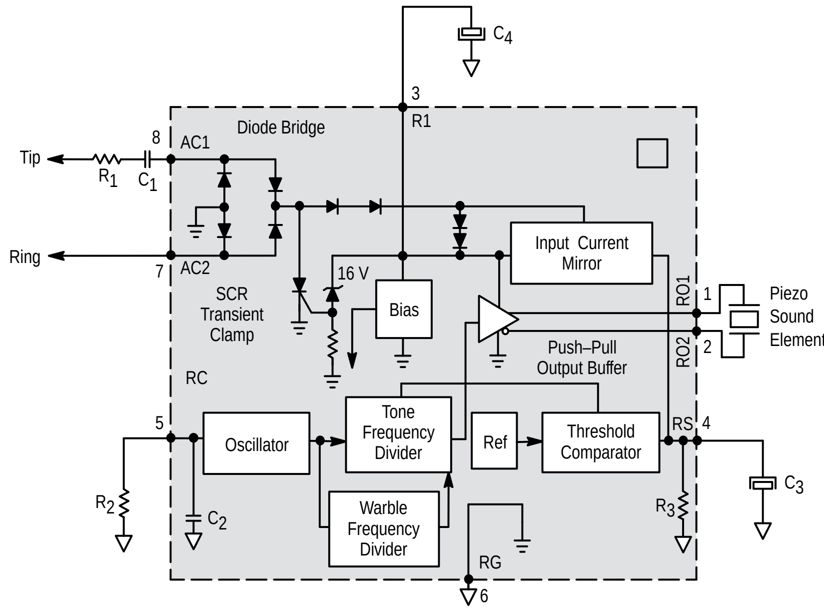


Tone Ringers (continued)

MC34217P, D

T_A = –20° to +60°C, Case 626, 751

- Complete Telephone Bell Replacement
- On–Chip Diode Bridge
- Internal Transient Protection
- Differential Output to Piezo Transducer for Louder Sound
- Input Impedance Signature Meets Bell and EIA Standards
- Rejects Rotary Dial and Hook Switch Transients
- Base Frequency and Warble Frequencies are Independently Adjustable
- Adjustable Base Frequency
- Reduced Number of Externals



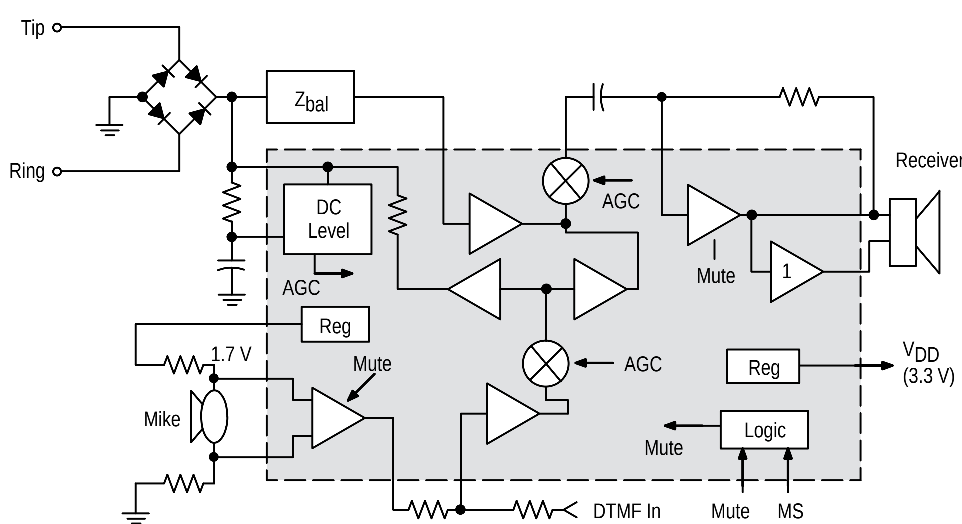
Speech Networks

Telephone Speech Network with Dialer Interface

MC34114P, DW

T_A = –20° to +70°C, Case 707, 751D

- Operation Down to 1.2 V
- Adjustable Transmit, Receive, and Sidetone Gains by External Resistors
- Differential Microphone Amplifier Input Minimizes RFI
- Transmit, Receive, and Sidetone Equalization on both Voice and DTMF Signals
- Regulated 1.7 V Output for Biasing Microphone
- Regulated 3.3 V Output for Powering External Dialer
- Microphone and Receive Amplifiers Muted During Dialing
- Differential Receive Amplifier Output Eliminates Coupling Capacitor
- Operates with Receiver Impedances of 150 Ω and Higher



Cordless Universal Telephone Interface

MC34016DW, P

T_A = –20° to +70°C, Case 751D, 738

The MC34016 is a telephone line interface meant for use in cordless telephone base stations for CT0, CT1, CT2 and DECT. The circuit forms the interface towards the telephone line and performs all speech and line interface functions like dc and ac line termination, 2–4 wire conversion, automatic gain control and hookswitch control. Adjustment of transmission parameters is accomplished by two 8 bit registers accessible via the integrated serial bus interface and by external components.

- DC Masks for Voltage and Current Regulation
- Supports Passive or Active AC Set Impedance Applications
- Double Wheatstone Bridge Sidetone Architecture
- Symmetrical Inputs and Outputs with Large Signal Swing Capability
- Gain Setting and Mute Function for T_X and R_X Amplifiers
- Very Low Noise Performance
- Serial Bus Interface SPI Compatible
- Operation from 3.0 V to 5.5 V

FEATURES

Line Driver Architecture

- Two DC Masks for Voltage Regulation
- Two DC Masks for Current Regulation
- Passive or Active Set Impedance Adjustment
- Double Wheatstone Bridge Architecture
- Automatic Gain Control Function

Transmit Channel

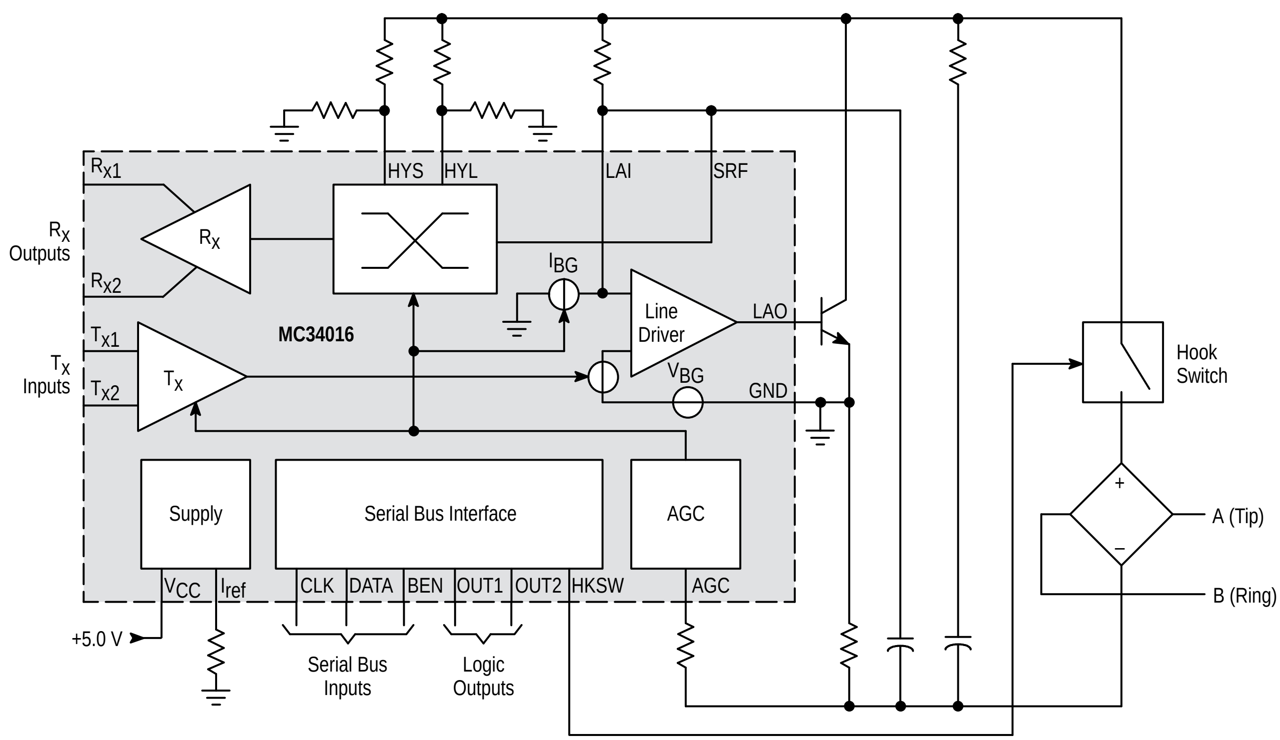
- Symmetrical Inputs Capable of Handling Large Voltage Swing
- Gain Select Option via Serial Bus Interface
- Transmit Mute Function, Programmable via Bus
- Large Voltage Swing Capability at the Telephone Line

Receive Channel

- Double Sidetone Architecture for Optimum Line Matching
- Symmetrical Outputs Capable of Producing High Voltage Swing
- Gain Select Option via Serial Bus Interface
- Receive Mute Function, Programmable via Serial Bus

Serial Bus Interface

- 3–Wire Connection to Microcontroller
- One Programmable Output Meant for Driving a Hookswitch
- Two Programmable Outputs Capable of Driving Low Ohmic Loads
- Two Eight Bit Registers for Parameter Adjustment



Programmable Telephone Line Interface Circuit with Loudspeaker Amplifier

MC34216DW

T_A = 0° to +70°C, Case 751F

The MC34216 is developed for use in telephone applications where besides the standard telephone functions also the group listening–in feature is required. In cooperation with a microcontroller, the circuit performs all basic telephone functions including DTMF generation and pulse–dialing. The listening–in part includes a loudspeaker amplifier, an anti–howling circuit and a strong supply. In combination with the TCA3385, the ringing is performed via the loudspeaker.

FEATURES

Line Driver and Supply

- DC and AC Termination of the Line
- Selectable Masks: France, U.K., Low Voltage
- Current Protection
- Adjustable Set Impedance for Resistive and Complex Termination
- Efficient Supply Point for Loudspeaker Amplifier and Peripherals

Handset Operation

- Transmit and Receive Amplifiers
- Adjustable Sidetone Network
- Line Length AGC
- Microphone and Earpiece Mute
- Earpiece Gain Increase Switch
- Microphone Squelch Function
- Transmit Amplifier Soft Clipping

Dialing and Ringing

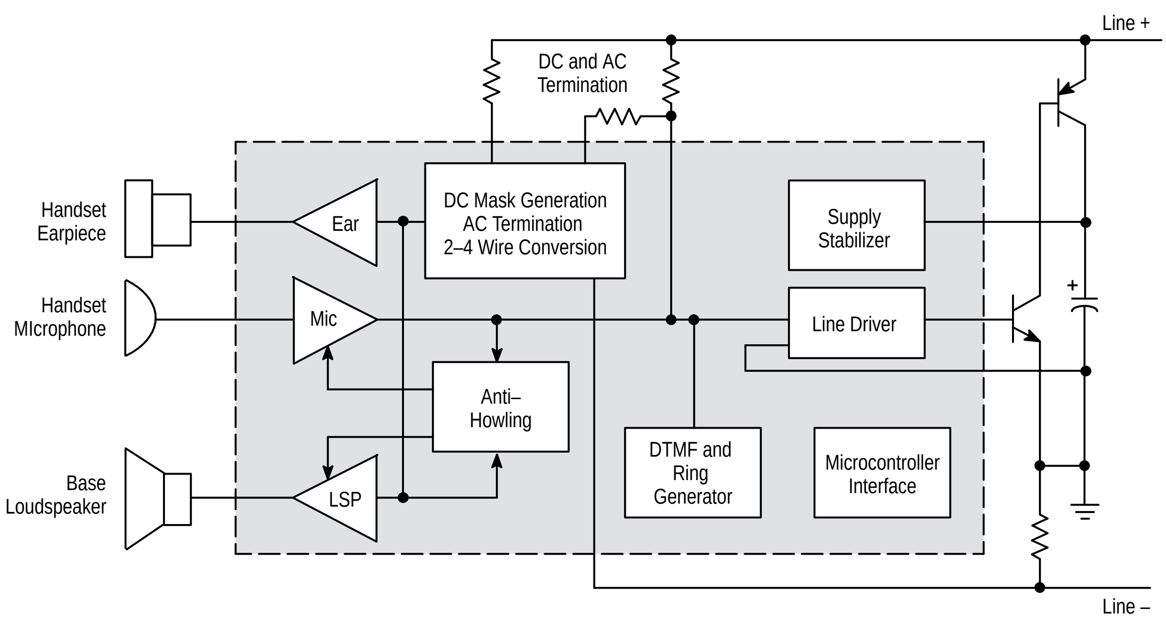
- Generates DTMF, Pilot Tones and Ring Signal
- Interrupter Driver for Pulse–Dialing
- Low Current While Pulse–Dialing
- Optimized for Ringing via Loudspeaker
- Programmable Ring Melodies
- Uses Inexpensive 500 kHz Resonator

Loudspeaking Facility

- Integrated Loudspeaker Amplifier
- Peak–to–Peak Limiter Prevents Distortion
- Programmable Volume
- Anti–Howling Circuitry for Group Listening–In
- Interfacing for Handsfree Conversation

Application Areas

- Corded Telephony with Group Listening–In
- Cordless Telephony Base Station with Group Listening–In
- Telephones with Answering Machines
- Fax, Intercom, Modem



Telephone Line Interface

TCA3388DP, FP

T_A = 0° to +70°C, Case 738, 751D

The TCA3388 is a telephone line interface circuit which performs the basic functions of a telephone set in combination with a microcontroller and a ringer. It includes dc and ac line termination, the hybrid function with 2 adjustable sidetone networks, handset connections and an efficient supply point.

FEATURES

Line Driver and Supply

- DC and AC Termination of the Telephone Line
- Selectable DC Mask: France, U.K., Low Voltage
- Current Protection
- Adjustable Set Impedance for Resistive and Complex Termination
- Efficient Supply Point for Peripherals
- Hook Status Detection

Handset Operation

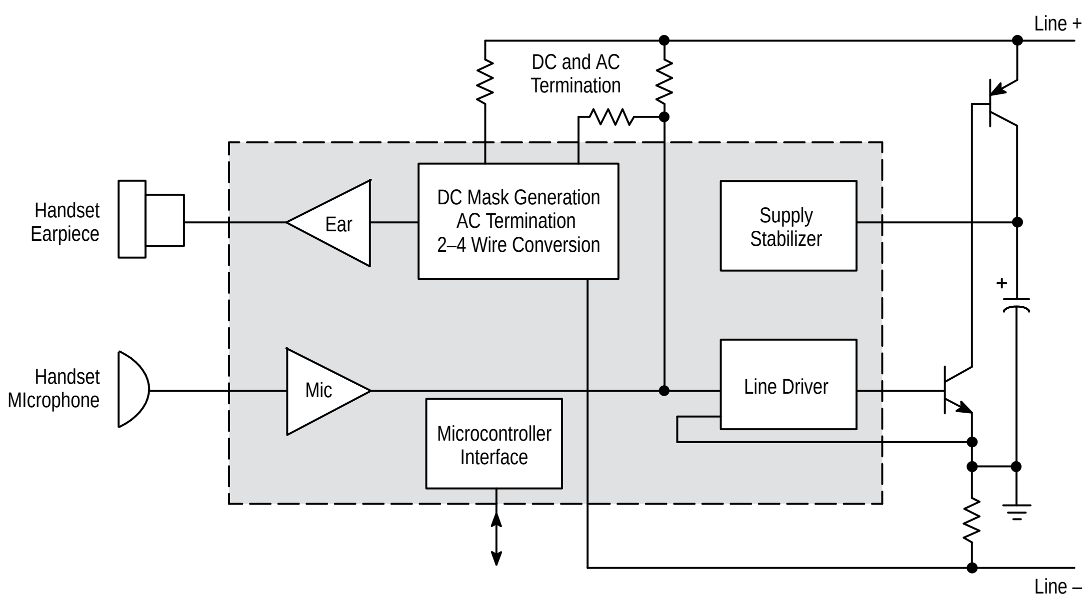
- Transmit and Receive Amplifiers
- Double Anti–Sidetone Network
- Line Length AGC
- Microphone and Earpiece Mute
- Transmit Amplifier Soft Clipping

Dialing and Ringing

- Interrupter Driver for Pulse–Dialing
- Reduced Current Consumption During Pulse–Dialing
- DTMF Interfacing
- Ringing via External Ringer

Application Areas

- Corded Telephony
- Cordless Telephony Base Station
- Answering Machines
- Fax
- Intercom
- Modem



Speakerphones

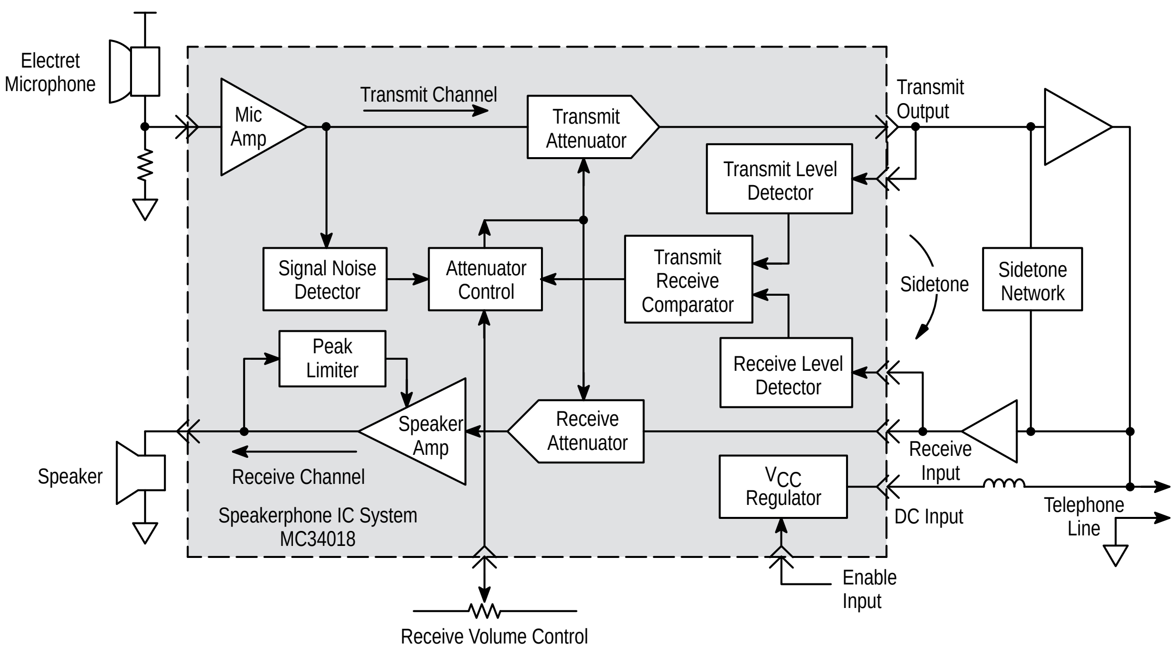
Voice Switched Speakerphone Circuit

MC34018P, DW

T_A = –20° to +60°C, Case 710, 751F

The MC34018 Speakerphone integrated circuit incorporates the necessary amplifiers, attenuators, and control functions to produce a high quality hands–free speakerphone system. Included are a microphone amplifier, a power audio amplifier for the speaker, transmit and receive attenuators, a monitoring system for background sound level, and an attenuation control system which responds to the relative transmit and receive levels as well as the background level. Also included are all necessary regulated voltages for both internal and external circuitry, allowing line–powered operation (no additional power supplies required). A Chip Select pin allows the chip to be powered down when not in use. A volume control function may be implemented with an external potentiometer. MC34018 applications include speakerphones for household and business uses, intercom systems, automotive telephones, and others.

- All Necessary Level Detection and Attenuation Controls for a Hands–Free Telephone in a Single Integrated Circuit
- Background Noise Level Monitoring with Long Time Constant
- Wide Operating Dynamic Range Through Signal Compression
- On–Chip Supply and Reference Voltage Regulation
- Typical 100 mW Output Power (into 25 Ω) with Peak Limiting to Minimize Distortion
- Chip Select Pin for Active/Standby Operation
- Linear Volume Control Function



Voice Switched Speakerphone Circuit

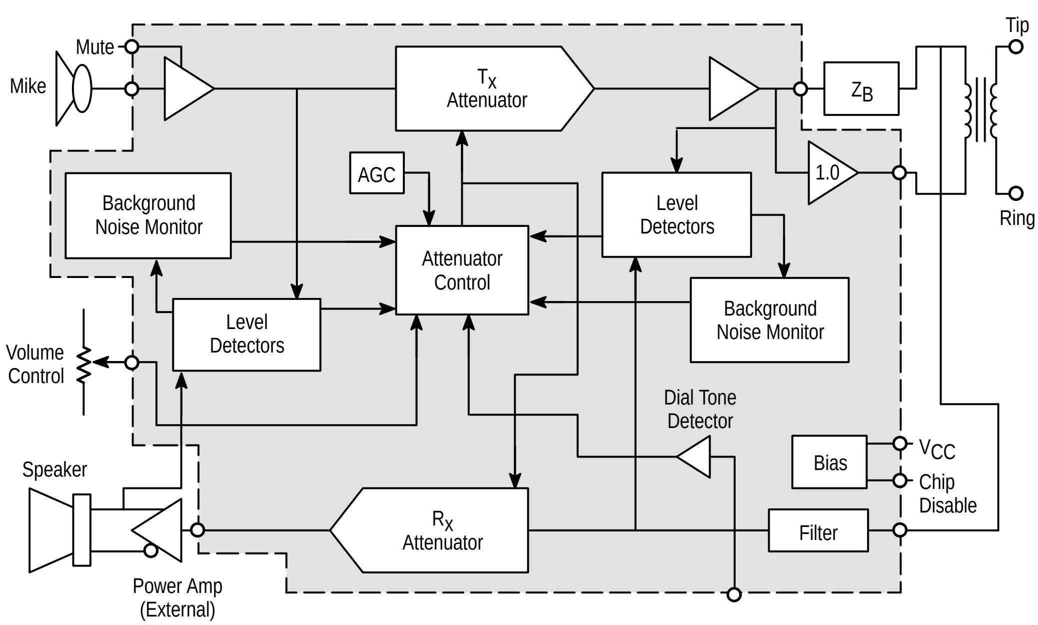
MC34118P, DW

T_A = –20° to +60°C, Case 710, 751F

The MC34118 Voice Switched Speakerphone circuit incorporates the necessary amplifiers, attenuators, level detectors, and control algorithm to form the heart of a high quality hands–free speakerphone system. Included are a microphone amplifier with adjustable gain and mute control, Transmit and Receive attenuators which operate in a complementary manner, level detectors at input and output of both attenuators,and background noise monitors for both the transmit and receive channels. A dial tone detector prevents the dial tone from being attenuated by the Receive background noise monitor circuit. Also included are two line driver amplifiers which can be used to form a hybrid network in conjunction with an external coupling transformer. A high–pass filter can be used to filter out 60 Hz noise in the receive channel, or for other filtering functions. A Chip Disable pin permits powering down the entire circuit to conserve power on long loops where loop current is at a minimum.

The MC34118 may be operated from a power supply, or it can be powered from the telephone line, requiring typically 5.0 mA. The MC34118 can be interfaced directly to Tip and Ring (through a coupling transformer) for stand–alone operation, or it can be used in conjunction with a handset speech network and/or other features of a featurephone.

- Improved Attenuator Gain Range: 52 dB Between Transmit and Receive
- Low Voltage Operation for Line–Powered Applications (3.0 to 6.5 V)
- 4–Point Signal Sensing for Improved Sensitivity
- Background Noise Monitors for Both Transmit and Receive Paths
- Microphone Amplifier Gain Set by External Resistors – Mute Function Included
- Chip Disable for Active/Standby Operation
- On Board Filter Pinned–Out for User Defined Function
- Dial Tone Detector Inhibits Receive Idle Mode During Dial Tone Presence
- Compatible with MC34119 Speaker Amplifier



Voice Switched Speakerphone with µProcessor Interface

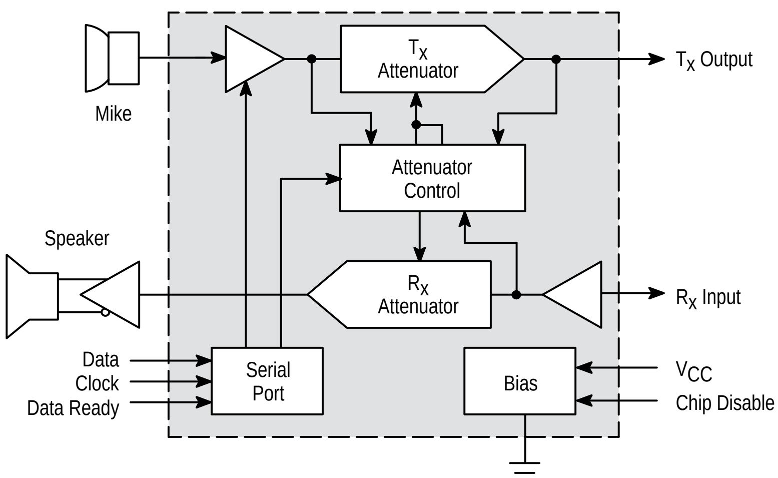
MC33218AP, DW

T_A = –40° to +85°C, Case 724, 751E

The MC33218A, Voice Switched Speakerphone circuit incorporates the necessary amplifiers, attenuators, level detectors, and control algorithm to form the heart of a high quality hands–free speakerphone system. Included are a microphone amplifier with adjustable gain, and mute control, transmit and receive attenuators which operate in a complementary manner, and level detectors and background noise monitors for both paths. A dial tone detector prevents dial tone from being attenuated by the receive background noise monitor. A Chip Disable pin permits powering down the entire circuit to conserve power.

Also included is an 8–bit serial µprocessor port for controlling the receive volume, microphone mute, attenuator gain, and operation mode (force to transmit, force to receive, etc.). Data rate can be up to 1.0 MHz. The MC33218A can be operated from a power supply, or from the telephone line, requiring typically 3.8 mA. It can also be used in intercoms and other voice–activated applications.

- Low Voltage Operation: 2.5 to 6.0 V
- 2–Point Sensing, Background Noise Monitor in Each Path
- Chip Disable Pin for Active/Standby Operation
- Microphone Amplifier Gain Set by External Resistors – Mute Function Included
- Dial Tone Detector to Inhibit Receive Idle Mode During Dial Tone Presence
- Microprocessor port for controlling:
  - Receive Volume Level (16 Steps)
  - Attenuator Range (26 or 52 dB, Selectable)
  - Microphone Mute
  - Force to Transmit, Receive, Idle or Normal Voice Switched Operation
- Compatible with MC34119 Speaker Amplifier



Voice Switched Speakerphone Circuit

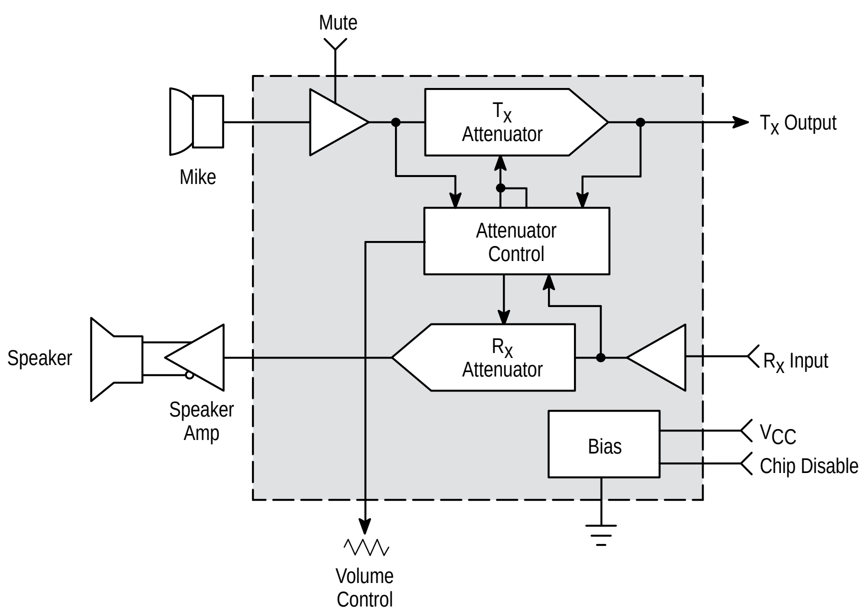
MC33219AP, ADW

T_A = –40° to +85°C, Case 724, 751E

The MC33219A Voice Switched Speakerphone Circuit incorporates the necessary amplifiers, attenuators, level detectors, and control algorithm to form the heart of a high quality hands–free speakerphone system. Included are a microphone amplifier with adjustable gain, and mute control, transmit and receive attenuators which operate in a complementary manner, and level detectors and background noise monitors. A dial tone detector prevents dial tone from being attenuated by the receive background noise monitor. A Chip Disable pin permits powering down the entire circuit to conserve power.

The MC33219A may be operated from a power supply, or it can be powered from the telephone line requiring typically 4.0 mA. The MC33219A can be interfaced directly to Tip and Ring (through a coupling transformer for stand–alone operation, or it can be used in conjuction with a handset speech network and/or other features of a featurephone.

- Low Voltage Operation: 2.7 to 6.0 V
- 2–Point Sensing, Background Noise Monitor in Each Path
- Chip Disable Pin for Active/Standby Operation
- Microphone Amplifier Gain Set by External Resistors – Mute Function Included
- Dial Tone Detector to Inhibit Receive Idle Mode During Dial Tone Presence
- Volume Control Range: 34 dB
- Compatible with MC34119 Speaker Amplifier



Speakerphones (continued)

Table 9. The Motorola Family of Speakerphone Integrated Circuits

MC34018	MC34118	MC33218A	MC33219A
Two point sensing with slow idle, background noise monitor in T_X path only	Four point sensing with both fast and slow idle modes, background noise monitors in both R_X and T_X paths	Two point sensing with slow idle, background noise monitors in both R_X and T_X paths	Two point sensing with slow idle, background noise monitors in both R_X and T_X paths
No dial tone detector in receive path	Receive path has dial tone detector	Receive path has dial tone detector	Receive path has dial tone detector
Attenuator Characteristics: • Range: 44 dB • Tolerance: ±4.0 dB • Gain tracking not specified • White noise is constant	Attenuator Characteristics: • Range: 52 dB • Tolerance: ±2.0 dB • Gain Tracking: <1.0 dB • White noise reduces with volume	Attenuator Characteristics: • Range: 52 or 26 dB (selectable) • Tolerance: ±3.0 dB • Gain Tracking: <1.0 dB • White noise reduces with volume	Attenuator Characteristics: • Range: 52 dB • Tolerance: ±3.0 dB • Gain Tracking: <1.0 dB • White noise reduces with volume
External hybrid required	Hybrid amplifiers on board	External hybrid required	External hybrid required
Speaker amplifier is on board (34 dB, 100 mW)	External speaker amplifier required (MC34119)	External speaker amplifier required (MC34119)	External speaker amplifier required (MC34119)
Filtering is external	Configurable filter on board	Filtering is external	Filtering is external
Microphone amplifier has fixed gain and no muting	Microphone amplifier has adjustable gain and mute input	Microphone amplifier has adjustable gain, and can be muted through µP port	Microphone amplifier has adjustable gain and a mute input
Supply Voltage: 4.0 V to 11 V	Supply Voltage: 2.8 V to 6.5 V	Supply Voltage: 2.5 V to 6.5 V	Supply Voltage: 2.7 V to 6.5 V
Supply Current: 6.5 mA typ., 9.0 mA max	Supply Current: 5.5 mA typ., 8.0 mA max	Supply Current: 4.0 mA typ., 5.0 mA max	Supply Current: 3.0 mA typ., 5.0 mA max
Speaker amplifier reduces gain to prevent clipping	Receive gain is reduced as supply voltage falls to prevent clipping	Receive gain is reduced as supply voltage falls to prevent clipping	Receive gain is reduced as supply voltage falls to prevent clipping
Volume control is linear. Cannot override voice switched operation except through additional circuitry. Attenuator gain is fixed at 44 dB (slightly variable). No microphone mute.	Volume control is linear, and microphone mute has separate pin. Cannot override voice switched operation except through additional circuitry. Attenuator gain is fixed at 52 dB.	8–bit µP serial port controls: • Volume control (16 steps) • Microphone mute • Range selection (26 dB or 52 dB) • Force to transmit, idle, receive, or normal voice switched operation	Volume control is linear, and microphone mute has separate pin. Attenuator range fixed at 52 dB. Cannot override voice switched operation except through additional circuitry.
28 Pin DIP and SOIC packages	28 Pin DIP and SOIC packages	24 Pin narrow DIP and SOIC packages	24 Pin narrow DIP and SOIC packages
External Required: • 12 Resistors • 11 Capacitors (≤1.0 µF) • 8 Capacitors (>1.0 µF)	External Required: • 14 Resistors • 12 Capacitors (≤1.0 µF) • 9 Capacitors (>1.0 µF)	External Required: • 12 Resistors • 11 Capacitors (≤1.0 µF) • 4 Capacitors (>1.0 µF)	External Required: • 12 Resistors • 11 Capacitors (≤1.0 µF) • 4 Capacitors (>1.0 µF)
Temperature Range: –20° to +60°C	Temperature Range: –20° to +60°C	Temperature Range: –40° to +85°C	Temperature Range: –40° to +85°C

Telephone Accessory Circuits

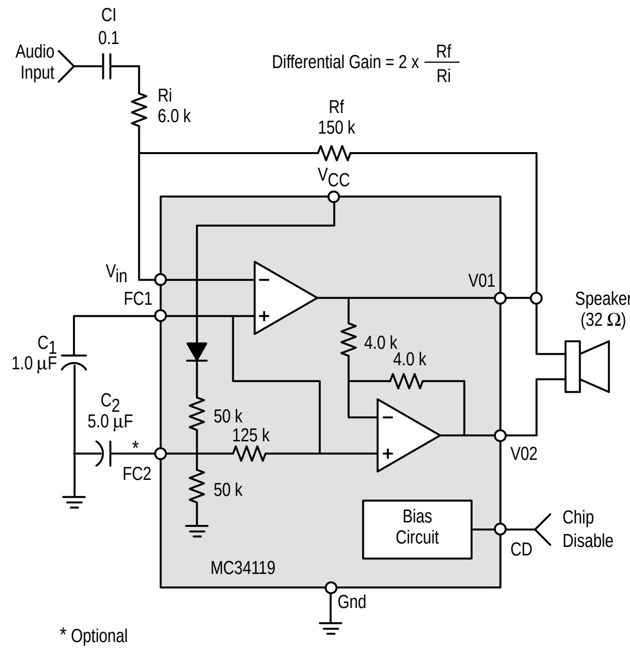
Audio Amplifier

MC34119P, D

T_A = 0° to +70°C, Case 626, 751

A low power audio amplifier circuit intended (primarily) for telephone applications, such as speakerphones. Provides differential speaker outputs to maximize output swing at low supply voltages (2.0 V min.). Coupling capacitors to the speaker, and snubbers, are not required. Overall gain is externally adjustable from 0 to 46 dB. A Chip Disable pin permits powering–down to mute the audio signal and reduce power consumption.

- Drives a Wide Range of Speaker Loads (16 to 100 Ω)
- Output Power Exceeds 250 mW with 32 Ω Speaker
- Low Distortion (THD = 0.4% Typical)
- Wide Operating Supply Voltage (2.0 V to 16 V) – Allows Telephone Line Powered Applications.
- Low Quiescent Supply Current (2.5 mA Typical)
- Low Power–Down Quiescent Current (60 µA Typical)



Current Mode Switching Regulator

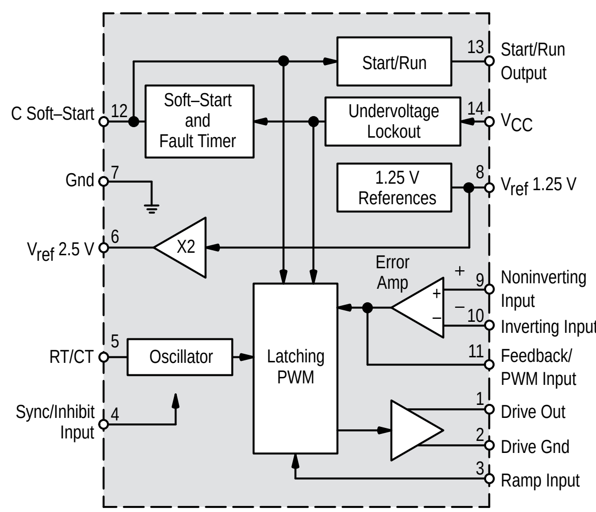
MC34129P, D

T_A = 0° to +70°C, Case 646, 751A

High performance current mode switching regulator for low–power digital telephones. Unique internal fault timer provides automatic restart for overload recovery. A start/run comparator is included to implement bootstrapped operation of V_{CC}.

Although primarily intended for digital telephone systems, these devices can be used cost effectively in many other applications. On–chip functions and features include:

- Current Mode Operation to 300 kHz
- Automatic Feed Forward Compensation
- Latching PWM for Cycle–By–Cycle Current Limiting
- Latched–Off or Continuous Retry after Fault Timeout
- Soft–Start with Maximum Peak Switch Current Clamp
- Internally Trimmed 2% Bandgap Reference
- Input Undervoltage Lockout



300 Baud FSK Modems

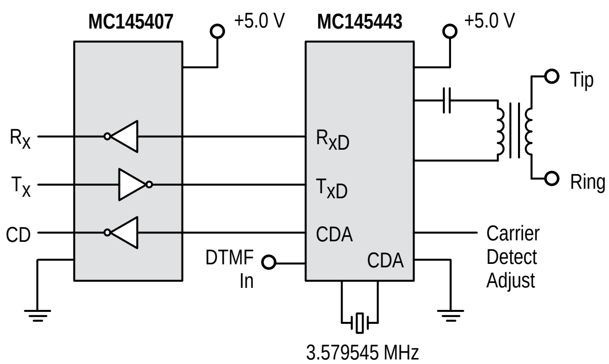
MC145442P, DW Modem – CCITT V.21
Case 738, 751D

MC145443P, DW Modem – Bell 103
Case 738, 751D

This powerful modem combines a complete FSK modulator/demodulator and an accompanying transmit/receive filter system on a single silicon chip. Designed for bidirectional transmission over the telephone network, the modem operates at 300 baud and can be obtained for compatibility with CCITT V.21 and Bell 103 specifications.

The modem contains an on–board carrier–detect circuit that allows direct operation on a telephone line (through a simple transformer), providing simplex, half–duplex, and full–duplex data communications. A built–in power amplifier is capable of driving –9.0 dBm onto a 600 Ω line in the transmit mode.

CMOS processing keeps power dissipation to a very low 45 mW, with a power–down dissipation of only 1.0 mW . . . from a single 5.0 V power supply. Available in a 20 pin dual–in–line P suffix, and a wide body surface mount DW suffix.



MC145444H, DW – CCITT V.21
Case 804, 751D

MC145446AFW – CCITT V.21
Case 751M

This device includes the DTMF generator and call progress tone detector (CPTD) as well as the other circuitry needed for full–duplex, half–duplex, or simplex 300 baud data communication over a pair of telephone lines. It is intended for use with telemeter system or remote control system applications.

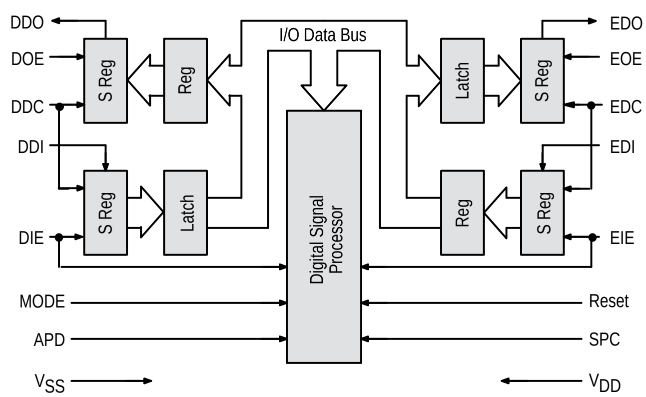
The differential line driver is capable of driving 0 dBm into a 600 Ω load. The transmit attenuator is programmable in 1.0 dB steps.

ADPCM Transcoder

MC145532DW, L
Case 751G, 620

The MC145532 Adaptive Differential Pulse Code Modulation (ADPCM) Transcoder provides a low cost, full–duplex, single–channel transcoder to (from) a 64 kbps PCM channel from (to) either a 16 kbps, 24 kbps, 32 kbps, or 64 kbps channel.

- Complies with CCITT Recommendation G.721 (1988)
- Complies with the American National Standard (T1.301–1987)
- Full–Duplex, Single–Channel Operation
- Mu–Law or A–Law Coding is Pin Selectable
- Synchronous or Asynchronous Operation
- Easily Interfaces with any Member of Motorola's PCM Codec–Filter Mono–Circuit Family or Other Industry Standard Codecs
- Serial PCM and ADPCM Data Transfer Rate from 64 kbps to 5.12 Mbps
- Power Down Capability for Low Cost Consumption
- The Reset State is Automatically Initiated when the Reset Pin is Released.
- Simple Time Slot Assignment Timing for Transcoder Applications
- Single 5.0 V Power Supply
- Evaluation Kit MC145536 EVK Supports the MC145532 as well as the MC145480 PCM Codec–Filter. (See PBX Architecture Pages for More Information.)



Calling Line Identification (CLID) Receiver with Ring Detector

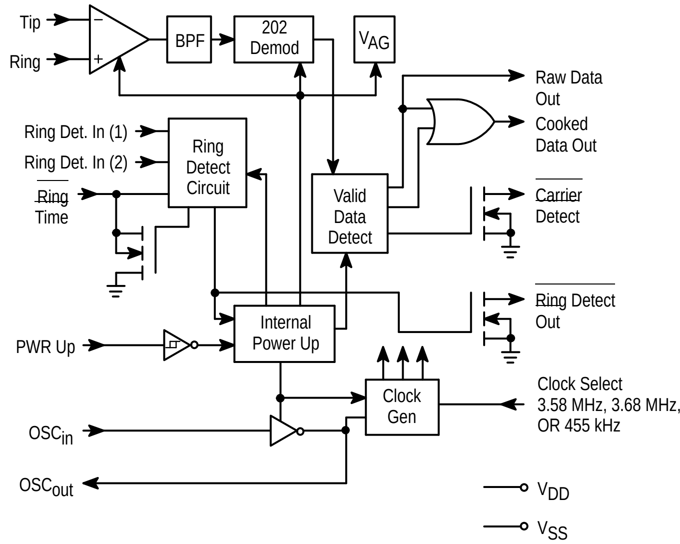
MC145447P, DW

Case 648, 751G

The MC145447 is designed to demodulate Bell 202 1200 baud FSK asynchronous data. Its primary application is in products that will be used to receive and display the calling number, or the message waiting indicator sent to subscribers from participating central office facilities of the public switched telephone network. The device also contains a carrier detect circuit and telephone ring detector which may be used to power up the device.

Applications include adjunct boxes, answering machines, feature phones, fax machines, and computer interface products.

- Ring Detector On–Chip
- Ring Detect Output for MCU Interrupt
- Power–Down Mode Less Than 1.0 µA
- Single Supply: 3.5 V to 6.0 V
- Pin Selectable Clock Frequencies: 3.68 MHz, 3.58 MHz, or 455 kHz
- Two–Stage Power–Up for Power Management Control

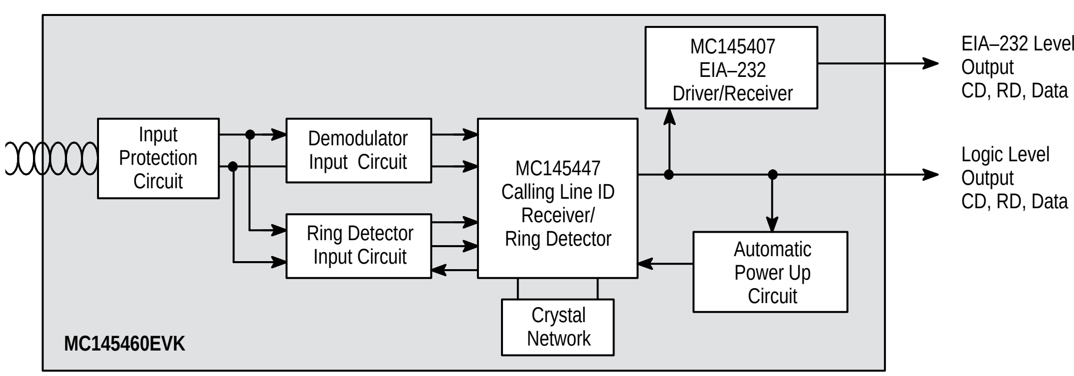


Calling Line ID Receiver Evaluation Kit

MC145460EVK

The MC145460EVK is a low cost evaluation platform for the MC145447. The MC145460EVK facilitates development and testing of products that support the Bellcore customer premises equipment (CPE) data interface, which enables services such as Calling Number Delivery (CND). The MC145447 can be easily incorporated into any telephone, FAX, PBX, key system, answering machine, CND adjunct box or other telephone equipment with the help of the MC145460EVK development kit.

- Easy Clip–On Access to Key MC145447 Signals
- Generous Prototype Area
- Configurable for MC145447 Automatic or External Power Up Control
- EIA–232 and Logic Level Ports for Connection to any PC or MCU Development Platform
- Carrier Detect, Ring Detect and Data Status LEDs
- Optional Tip and Ring Input Protection Network
- MC145460EVK User Guide, MC145447 Data Sheet, and Additional MC145447 Sample Included



Continuously Variable Slope Delta (CVSD) Modulator/Demodulator

MC34115P, DW
T_A = 0° to +70°C, Case 648, 751G

MC3418P, DW
T_A = 0° to +70°C, Case 648, 751G

Provides the A/D–D/A function of voice communications by digital transmission. Designed for speech synthesis and commercial telephone applications. A single IC provides both encoding and decoding.

- Encode and Decode Functions on the Same Chip with a Digital Input
- CMOS Compatible Digital Output
- Digital Input Threshold Selectable (V_{CC}/2 reference provided on Chip)
- MC34115 Has a 3–Bit Algorithm (General Communications)
- MC3418 Has a 4–Bit Algorithm (Commercial Telephone)

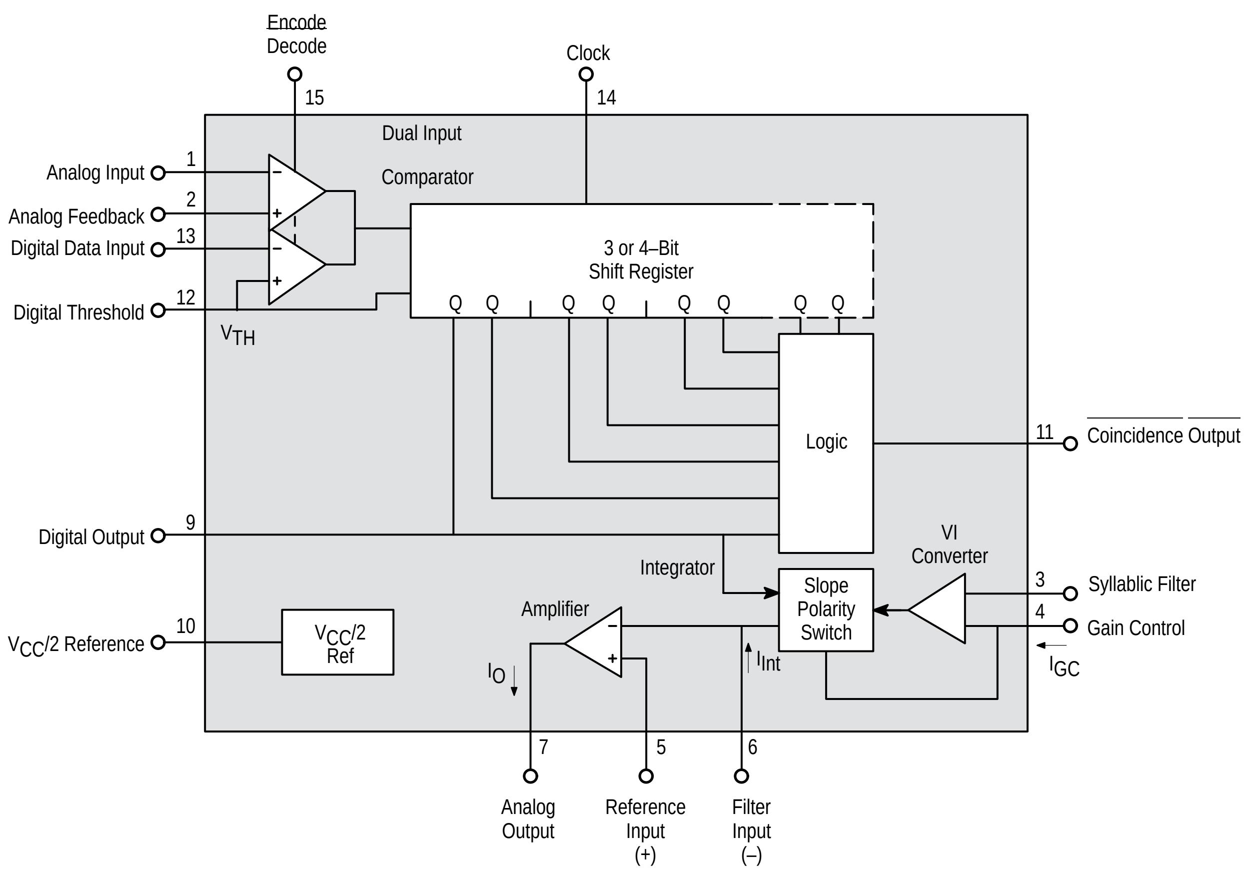


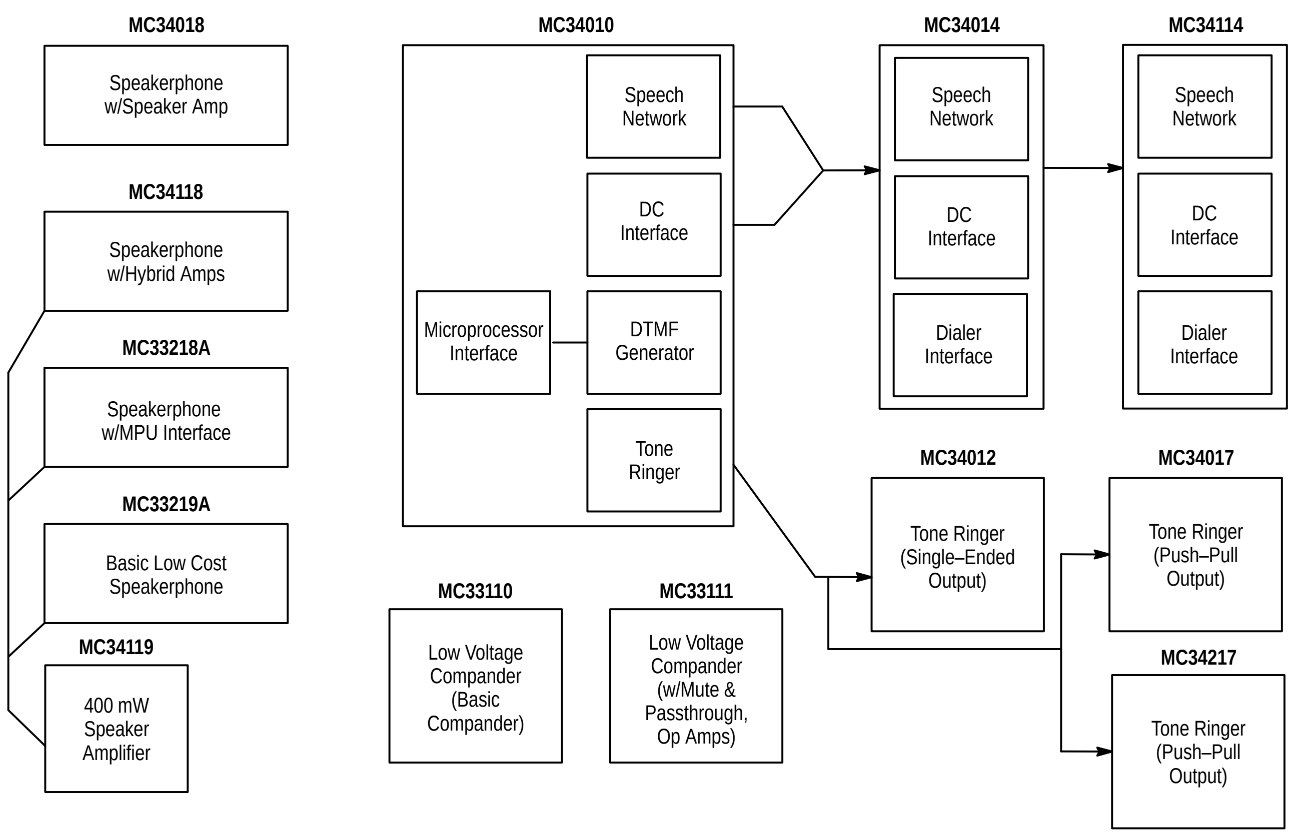
Table 10. Summary of Bipolar Telecommunication Circuits

Function	Features	Suffix/ Package	Device
Subscriber Loop Interface Circuits (SLICs)			
PBX Applications	All gains externally programmable, most BORSHT functions, current limit adjustable to 100 mA.	L/726	MC3419–1
Central Office, Remote Terminals, PBX Applications	All gains externally programmable, most BORSHT functions, current limit adjustable to 50 mA, 58 dB Longitudinal Balance, –21.6 V to –42 V.	P/738, FN/776	MC33121
Central Office, Remote Terminals, PBX Applications	All gains externally programmable, most BORSHT functions, current limit adjustable to 50 mA, 58 dB Longitudinal Balance, –42 V to –58 V.	P/738, FN/776	MC33120
Complete Telephone Circuit			
POTS Circuit + MPU Dialing	Speech network, tone ringer, dc loop current interface, DTMF dialer with serial port control.	P/711, FN/777	MC34010
Tone Ringers			
Adjustable Tone Ringer	Single–ended output, meets FCC requirements, adjustable REN, different warble rates.	P/626, D/751	MC34012–1, 2, 3
Adjustable Tone Ringer	Differential output, meets FCC requirements, adjustable REN, different warble rates.	P/626, D/751	MC34017–1, 2, 3
Adjustable Tone Ringer	Differential output, meets FCC requirements, adjustable REN, single warble rates.	P/626, D/751	MC34217
Speech Networks			
Basic Phone Line Interface	Loop current interface, speech network, line length compensation, speech/dialing modes, Bell System compliant.	P/707, DW/751D	MC34014
Cordless Universal Telephone Interface	Designed for digital cordless phones, SPI interface, double sidetone network, low noise and distortion.	P/738, DW/751D	MC34016
Basic Phone Line Interface	Loop current interface, speech network, line length compensation, speech/dialing modes, Bell System and foreign countries.	P/707, DW/751D	MC34114
Programmable Telephone Line Interface Circuit with Loudspeaker Amplifier	Group listening–in, DTMF and tones generator, ring generator, country programmable, SPI interface.	DW/751F	MC34216
Telephone Line Interface	Country programmable, double sidetone network, provides strong supply point.	DP/738, FP/751D	TCA3388
Speakerphone Circuits			
Complete Speaker Phone with Speaker Amplifier	All level detection (2 pt.), attenuators, and switching controls, mike and speaker amp.	P/710, DW/751F	MC34018
Complete Speaker Phone with Hybrid, Filter	All level detection (4 pt.), attenuators, and switching controls, mike amp with mute, hybrid, and filter.	P/710, DW/751F	MC34118
Complete Speaker Phone with MPU Interface	All level detection, attenuators, and switching controls, mike amp, MPU interface for: volume control, mode selection, mike mute.	P/724, DW/751E	MC33218A
Basic Low Cost Speakerphone	All level detection, attenuators and switching controls, Mike amplifier with Mute, low voltage operation.	P/724, DW/751E	MC33219A
Audio Amplifiers			
1 Watt Audio Amp	1.0 W output power into 16 Ω, 35 V maximum.	D/751	MC13060
Low Voltage Audio Amp	400 mW, 8.0 to 100 Ω, 2.0 to 16 V, differential outputs, chip–disable input pin.	P/626, D/751	MC34119

Summary of Bipolar Telecommunications Circuits (continued)

Function	Features	Suffix/ Package	Device
Companders			
Basic Compander	2.1 V to 7.0 V, no precision externals, 80 dB range, –40° to +85°C, independent compressor and expander.	P/646, D/751A	MC33110
Compander with Features	3.0 V to 7.0 V, no precision externals, 80 dB range, –40° to +85°C, independent compressor and expander, pass through and mute functions, two op amps.	P/648, D/751B	MC33111
Switching Regulator			
Current Mode Regulator	For phone line power applications, soft–start, current limiting, 2% accuracy.	P/646, D/751A	MC34129
Voice Encoder/Decoders			
Continuously Variable Slope Modulator/Demodulator (CVSD)	Telephone quality voice encoding/decoding, variable clock rate, 3–bit coding, for secure communications, voice storage/retrieval, answering machines, 0° to 70°C.	P/738, DW/751G	MC34115
	Same as above except 4–bit coding.	P/738, DW751G	MC3418

Figure 3. The Motorola Family of Handset Telecom Integrated Circuits



Phase–Locked Loop Components

Motorola offers a choice of phase–locked loop components ranging from complete functional frequency synthesizers for dedicated applications to a wide selection of general purpose PLL circuit elements. Technologies include CMOS for lowest power consumption and bipolar for high speed operation. Typical applications include TV, CATV, radios, scanners, cordless telephones plus home and personal computers.

Table 11. PLL Frequency Synthesizers

Frequency (MHz)	Supply Voltage (V)	Nominal Supply Current (mA)	Phase Detector	Standby	Interface	Device	Suffix/ Case
4.0 @ 5.0 V	4.5 to 12	6.0 @ 5.0 V	Single–ended 3–state	No	Parallel	MC145106	P/707, DW/751D
15 @ 5.0 V	3.0 to 9.0	–	Two single–ended 3–state		Serial	MC145149*	P/738, DW/751D
		7.5 @ 5.0 V	Analog			MC145159–1	P/738, DW/751D
20 @ 5.0 V	3.0 to 9.0	7.5 @ 5.0 V	Single–ended 3–state, double–ended		4–Bit	MC145145–2	P/707, DW/751D
						MC145146–2	P/738, DW/751D
					Parallel	MC145151–2	P/710, DW/751F
			Double–ended			MC145152–2	P/710, DW/751F
			Single–ended 3–state, double–ended		Serial	MC145155–2	P/707, DW/751D
						MC145156–2	P/707, DW/751D
						MC145157–2	P/648, DW/751G
						MC145158–2	P/648, DW/751G
60 @ 3.0 V	2.5 to 5.5	3.0 @ 3.0 V	Two single–ended 3–state	Yes		MC145162*	P/648, DW/751G
60 @ 2.0 V	1.8 to 3.6	1.5 @ 1.8 V				MC145165*	P/648, D/751B
60 @ 3.0 V	2.5 to 5.5	3.0 @ 3.0 V			Parallel	MC145166*	P/648, DW/751G
					Serial	MC145167*	P/648, DW/751G
					Parallel	MC145168*	
					Serial	MC145169*	
85 @ 3.0 V	2.5 to 5.5	3.0 @ 3.0 V				MC145162–1*	P/648, DW/751G
40/130 @ 5.0 V	4.5 to 5.5	9.0 @ 5.0 V	Single–ended 3–state, Current source/sink			MC145173	DW/751E
100 @ 3.0 V 185 @ 5.0 V	2.5 to 5.5	2.0 @ 3.0 V 6.0 @ 5.0 V		No		MC145170–1	P/648, D/751B

* Dual PLL

Phase–Locked Loop Components (continued)

PLL Frequency Synthesizers (continued)

Frequency (MHz)	Supply Voltage (V)	Nominal Supply Current (mA)	Phase Detector	Standby	Interface	Device	Suffix/ Case
1100 @ 5.0 V	4.5 to 5.5	7.0 @ 5.0 V	Current source/sink, double–ended	Yes	Serial	MC145190	F/751J, DT/948D
						MC145191	F/751J, DT/948D
1100 @ 3.0 V	2.7 to 5.0	6.0 @ 2.7 V				MC145192	F/751J, DT/948D
1100 @ 3.0 V	2.7 to 5.5	12	Two current source/sink, double–ended			MC145220*	F/803C, DT/948D
2000 @ 5.0 V	4.5 to 5.5	12 @ 5.0 V	Current source/sink, double–ended			MC145200	F/751J, DT/948D
2000 @ 5.0 V	4.5 to 5.5	12 @ 5.0 V				MC145201	F/751J, DT/948D
2000 @ 3.0 V	2.7 to 5.5	4.0 @ 3.0 V				MC145202	F/751J, DT/948D

* Dual PLL

Table 12. Phase–Locked Loop Functions

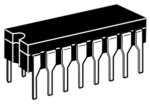
Device	Function	Pins	DIP	SM
MC4016	Programmable Modulo–N Counters (N=0–9)	16	P,L	
MC4018	Programmable Modulo–N Counters (N=0–9)	16	P,L	
MC4024	Dual Voltage–Controlled Multivibrator	14	P,L	
MC4044	Phase–Frequency Detector	14	P,L	D
MC4316	Programmable Modulo–N Counters (N=0–9)	16	P,L	
MC4324	Dual Voltage–Controlled Multivibrator	14	P,L	
MC4344	Phase–Frequency Detector	14	P,L	
MC12002	Analog Mixer	14	P,L	
MC12009	480 MHz ÷5/6 Dual Modulus Prescaler	16	P,L	
MC12011	550 MHz ÷8/9 Dual Modulus Prescaler	16	P,L	
MC12013	550 MHz ÷10/11 Dual Modulus Prescaler	16	P,L	
MC12014	Counter Control Logic	16	P,L	
MC12015	225 MHz ÷32/33 Dual Modulus Prescaler	8	P,L	D
MC12016	225 MHz ÷40/41 Dual Modulus Prescaler	8	P,L	D
MC12017	225 MHz ÷64/65 Dual Modulus Prescaler	8	P,L	D
MC12018	520 MHz ÷128/129 Dual Modulus Prescaler	8	P,L	D
MC12019	225 MHz ÷20/21 Dual Modulus Prescaler	8	P,L	D
MC12022A	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12022B	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D

Phase–Locked Loop Components (continued)

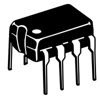
Phase–Locked Loop Functions (continued)

Device	Function	Pins	DIP	SM
MC12022LVA	1.1 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12022LVB	1.1 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12022SLA	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12022SLB	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12022TSA	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12022TSB	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12022TVA	1.1 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12022TVB	1.1 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12023	225 MHz ÷64 Prescaler	8	P	D
MC12025	520 MHz ÷64/65 Dual Modulus Prescaler	8	P	D
MC12026A	1.1 GHz ÷8/9, ÷16/17 Dual Modulus Prescaler	8	P	D
MC12026B	1.1 GHz ÷8/9, ÷16/17 Dual Modulus Prescaler	8	P	D
MC12028A	1.1 GHz ÷32/33, ÷64/65 Dual Modulus Prescaler	8	P	D
MC12028B	1.1 GHz ÷32/33, ÷64/65 Dual Modulus Prescaler	8	P	D
MC12031A	2.0 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12031B	2.0 GHz ÷64/65, ÷128/129 Low Voltage Dual Modulus Prescaler	8	P	D
MC12032A	2.0 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12032B	2.0 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler	8	P	D
MC12033A	2.0 GHz ÷32/33, ÷64/65 Low Voltage Dual Modulus Prescaler	8	P	D
MC12033B	2.0 GHz ÷32/33, ÷64/65 Low Voltage Dual Modulus Prescaler	8	P	D
MC12034A	2.0 GHz ÷32/33, ÷64/65 Dual Modulus Prescaler	8	P	D
MC12034B	2.0 GHz ÷32/33, ÷64/65 Dual Modulus Prescaler	8	P	D
MC12036A	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler with Stand–By Mode	8	P	D
MC12036B	1.1 GHz ÷64/65, ÷128/129 Dual Modulus Prescaler with Stand–By Mode	8	P	D
MC12040	Phase–Frequency Detector	14	P,L	FN
MC12061	Crystal Oscillator	16	P,L	
MC12073	1.1 GHz ÷64 Prescaler	8	P	D
MC12074	1.1 GHz ÷256 Prescaler	8	P	D
MC12076	1.3 GHz ÷256 Prescaler	8	P	D
MC12078	1.3 GHz ÷256 Prescaler	8	P	D
MC12079	2.8 GHz ÷64/128/256 Prescaler	8	P	D
MC12080	1.1 GHz ÷10/20/40/80 Prescaler	8	P	D
MC12083	1.1 GHz ÷2 Low Power Prescaler with Stand–By Mode	8	P	D
MC12089	2.8 GHz ÷64/128/256 Low Power Prescaler	8	P	D
MC12090	750 MHz ÷2 UHF Prescaler	16	P,L	
MC12100	200 MHz Voltage Controlled Multivibrator	20	P	FN
MC12101	130 MHz Voltage Controlled Multivibrator	20	P	FN
MCH12140	Phase–Frequency Detector	8		D
MCK12140	Phase–Frequency Detector	8		D
MC12148	Low Power Voltage Controlled Oscillator	8		D,SD

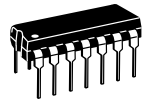
Communications Circuits Package Overview



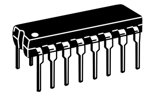
CASE 620
L SUFFIX



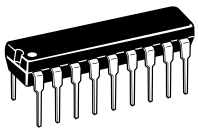
CASE 626
P SUFFIX



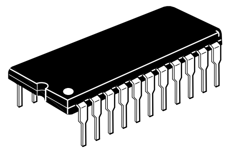
CASE 646
P SUFFIX



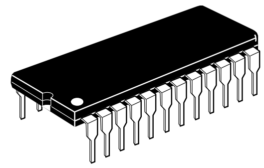
CASE 648
P SUFFIX



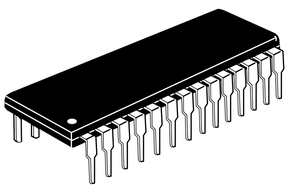
CASE 707
P SUFFIX



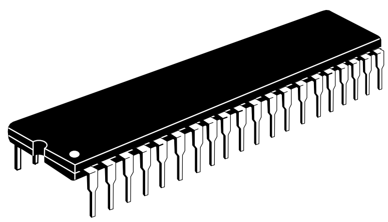
CASE 708
P SUFFIX



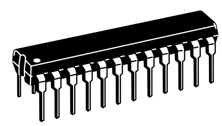
CASE 709
P SUFFIX



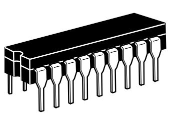
CASE 710
P SUFFIX



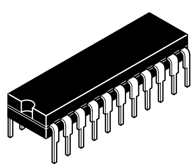
CASE 711
P SUFFIX



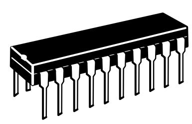
CASE 724
P SUFFIX



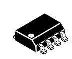
CASE 726
L SUFFIX



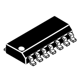
CASE 736B
PB SUFFIX



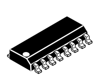
CASE 738
DP, P SUFFIX



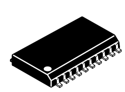
CASE 751
D SUFFIX



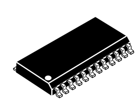
CASE 751A
D SUFFIX



CASE 751B
D SUFFIX

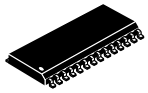


CASE 751D
DW, FP SUFFIX

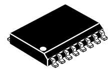


CASE 751E
DW SUFFIX

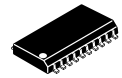
Communications Circuits Package Overview (continued)



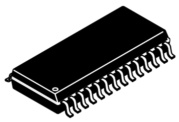
CASE 751F
DW SUFFIX



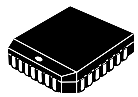
CASE 751G
DW SUFFIX



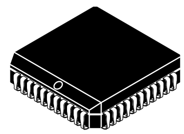
CASE 751J
F SUFFIX



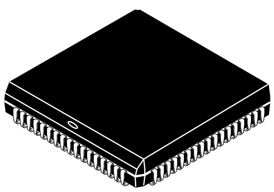
CASE 751M
FW SUFFIX



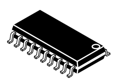
CASE 776
FN SUFFIX



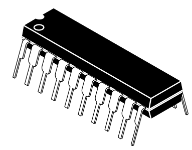
CASE 777
FN SUFFIX



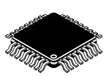
CASE 779
FN SUFFIX



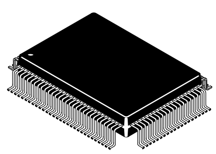
CASE 803C
F SUFFIX



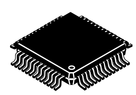
CASE 804
H SUFFIX



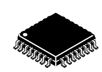
CASE 837A
DW SUFFIX



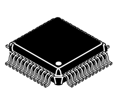
CASE 842D
PB SUFFIX



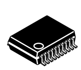
CASE 848B
FB SUFFIX



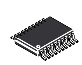
CASE 873
FB, FTB, FU SUFFIX



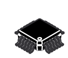
CASE 932
FTA SUFFIX



CASE 940C
SD SUFFIX



CASE 948D
DT SUFFIX



CASE 977
FTA SUFFIX